OPERATION & MAINTENANCE

Affinity Advanced Series

R-454B

60Hz

IGW5-0016Y

PROUD MEMBER

Intertek

Water Source HP
ANSI/AHRI/ASHRAE/ISO13256-1

ENERGY STAR PARTNER

⚠ WARNING

WARNING: Before performing service or maintenance operations on the system, turn off main power switches to the unit. Electrical shock could cause serious personal injury.

WARNING: All products are designed, tested, and manufactured to comply with the latest publicly released and available edition of UL 60335-2-40 for electrical safety certification. All field electrical connections must follow the National Electrical Code (NEC) guide standards and / or any local codes that may be applicable for the installation.

WARNING: Only factory authorized personnel are approved for startup, check test and commissioning of this unit.

INSTALLER: Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

OWNER: Keep this manual in a safe place in order to provide your service personnel with necessary information.

⚠ CAUTION

This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
Children should be supervised to ensure that they do not play with the appliance.

Maximum altitude for this equipment shall not exceed 2000 m.

For installation only in locations not accessible to the general public.

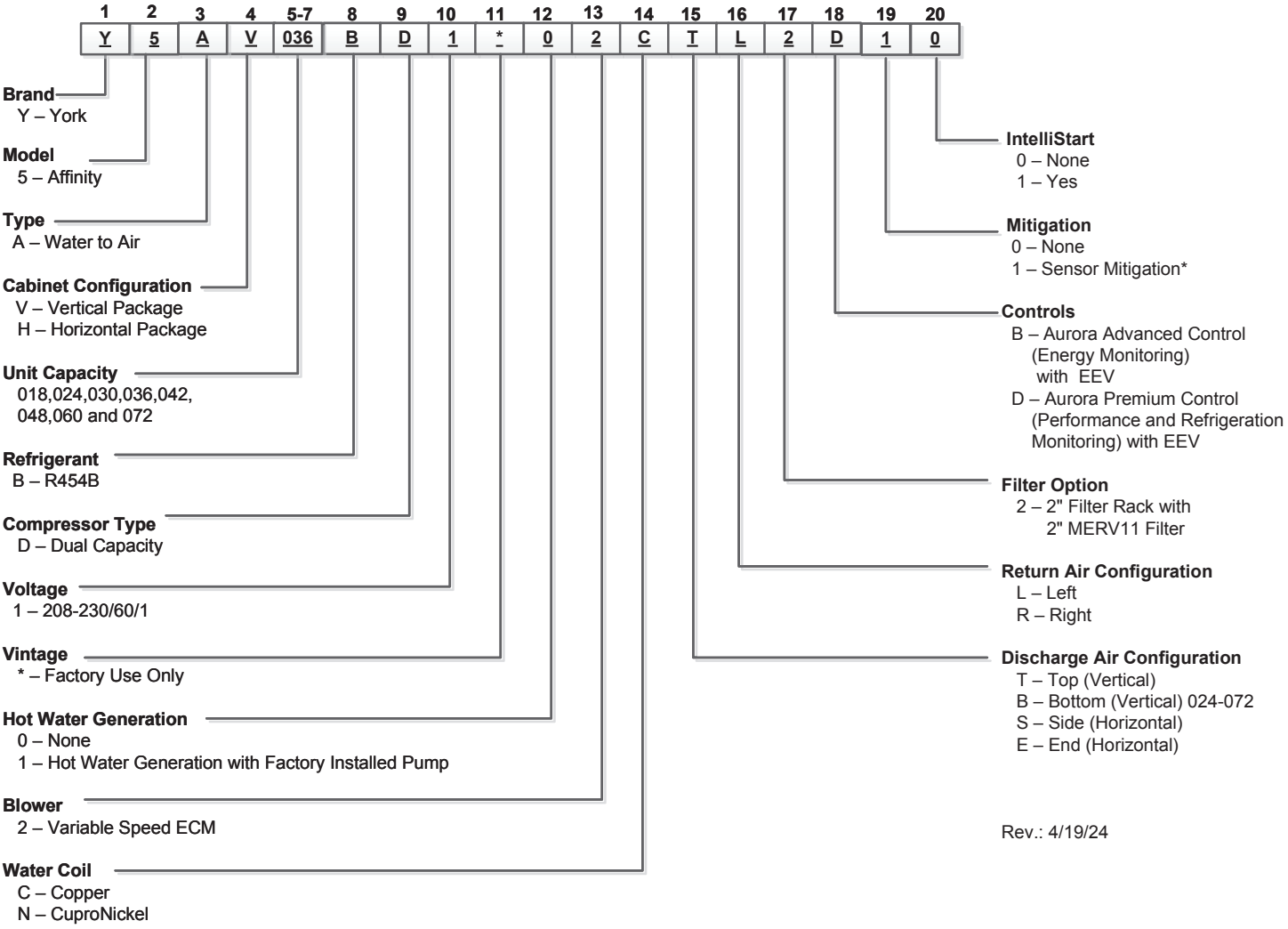
Installing and servicing air conditioning and heating equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service heating and air conditioning equipment. When working on heating and air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available for all brazing operations.

NOTE: Before installing, check voltage of unit(s) to ensure proper voltage.

Table of Contents

Nomenclature



Rev.: 4/19/24

* Sensor mitigation required on 048 horizontal models and all 060 and 072 models.

AHRI Data

The performance standard AHRI/ASHRAE/ISO 13256-1 became effective January 1, 2000 and replaces ARI Standards 320, 325, and 330. This new standard has three major categories: Water Loop (comparable to ARI 320), Ground Water (ARI 325), and Ground Loop (ARI 330). Although these standards are similar there are some differences:

Unit of Measure: The Cooling COP

The cooling efficiency is measured in EER (US version measured in Btu/h per Watt. The Metric version is measured in a cooling COP (Watt per Watt) similar to the traditional COP measurement.

Water Conditions Differences

Entering water temperatures have changed to reflect the centigrade temperature scale. For instance the water loop heating test is performed with 68°F (20°C) water rounded down from the old 70°F (21.1°C).

Air Conditions Differences

Entering air temperatures have also changed (rounded down) to reflect the centigrade temperature scale. For instance the cooling tests are performed with 80.6°F (27°C) dry bulb and 66.2°F (19°C) wet bulb entering air instead of the traditional 80°F (26.7°C) DB and 67°F (19.4°C) WB entering air temperatures. 80.6/66.2 data may be converted to 80/67 using the entering air correction table. This represents a significantly lower relative humidity than the old 80/67 of 50% and will result in lower latent capacities.

Pump Power Correction Calculation

Within each model, only one water flow rate is specified for all three groups and pumping Watts are calculated using the following formula. This additional power is added onto the existing power consumption.

- Pump power correction = (gpm x 0.0631) x (Press Drop x 2990) / 300
  Where 'gpm' is waterflow in gpm and 'Press Drop' is the pressure drop through the unit heat exchanger at rated water flow in feet of head.

Blower Power Correction Calculation

Blower power is corrected to zero external static pressure using the following equation. The nominal airflow is rated at a specific external static pressure. This effectively reduces the power consumption of the unit and increases cooling capacity but decreases heating capacity. These Watts are significant enough in most cases to increase EER and COPs fairly dramatically over ARI 320, 325, and 330 ratings.

- Blower Power Correction = (cfm x 0.472) x (esp x 249) / 300
  Where 'cfm' is airflow in cfm and 'esp' is the external static pressure at rated airflow in inches of water gauge.

ISO Capacity and Efficiency Calculations

The following equations illustrate cooling calculations:

- ISO Cooling Capacity = Cooling Capacity (Btu/h) + (Blower Power Correction (Watts) x 3.412)
- ISO EER Efficiency (W/W) = ISO Cooling Capacity (Btu/h) x 3.412 / [Power Input (Watts) - Blower Power Correction (Watts) + Pump Power Correction (Watt)]

The following equations illustrate heating calculations:

- ISO Heating Capacity = Heating Capacity (Btu/h) - (Blower Power Correction (Watts) x 3.412)
- ISO COP Efficiency (W/W) = ISO Heating Capacity (Btu/h) x 3.412 / [Power Input (Watts) - Blower Power Correction (Watts) + Pump Power Correction (Watt)]

Comparison of Test Conditions

	ARI 320	ISO/AHRI 13256-1 WLHP	ARI 325	ISO/AHRI 13256-1 GWHP	ARI 330	ISO/AHRI 13256-1 GLHP
Cooling						
Entering Air - DB/WB °F	80/67	80.6/66.2	80/67	80.6/66.2	80/67	80.6/66.2
Entering Water - °F	85	86	50/70	59	77	77
Fluid Flow Rate	*	**	**	**	**	**
Heating						
Entering Air - DB/WB °F	70	68	70	68	70	68
Entering Water - °F	70	68	50/70	50	32	32
Fluid Flow Rate	*	**	**	**	**	**

NOTES: * Flow rate is set by 10°F rise in standard cooling test
** Flow rate is specified by the manufacturer
Part load entering water conditions not shown
WLHP = Water Loop Heat Pump; GWHP = Ground Water Heat Pump; GLHP = Ground Loop Heat Pump

Conversions:

Airflow (lps) = cfm x 0.472;
ESP (Pascals) = ESP (in wg) x 249;
WaterFlow (lps) = gpm x 0.0631;
Press Drop (Pascals) = Press Drop (ft hd) x 2990

AHRI Data

Variable Speed ECM motor

AHRI/ASHRAE/ISO 13256-1

English (IP) Units

Model	Flow Rate		Ground Water Heat Pump				Ground Loop Heat Pump			
			Cooling EWT 59°F		Heating EWT 50°F		Cooling Brine Full Load 77°F Part Load 68°F		Heating Brine Full Load 32°F Part Load 41°F	
	gpm	cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
018	5	600	20,800	27.00	18,900	5.00	18,700	19.80	14,700	4.20
	4	500	15,200	29.50	14,200	5.10	14,700	24.80	12,400	4.70
024	8	950	26,400	25.20	23,300	4.90	25,000	19.20	19,400	4.10
	7	750	19,700	31.80	16,900	5.20	19,600	26.60	15,800	4.60
030	8	1000	35,200	27.50	31,100	4.80	32,300	20.30	24,600	4.00
	7	800	26,100	35.90	21,800	4.90	24,800	28.70	19,400	4.30
036	9	1300	41,800	28.40	36,000	5.30	38,500	20.80	29,600	4.50
	8	1150	31,000	35.60	25,900	5.50	30,300	30.00	23,600	5.00
042	11	1300	46,200	26.60	41,700	5.20	41,700	19.20	33,700	4.40
	10	1200	34,400	32.70	29,700	5.50	33,100	26.90	26,600	4.90
048	12	1600	53,100	24.90	49,300	5.10	50,500	18.90	40,100	4.40
	11	1400	39,900	32.70	35,500	5.50	39,200	27.30	32,000	5.00
060	16	1800	68,400	24.20	56,100	4.70	66,000	19.30	47,600	4.10
	14	1500	49,400	31.40	38,700	4.90	49,100	26.50	35,500	4.40
072	18	2000	78,100	23.10	71,400	4.60	73,400	18.30	57,900	4.00
	16	1500	58,900	29.70	52,600	4.60	56,300	25.10	47,600	4.20

Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature 5/1/24

Heating capacities based upon 68°F DB, 59°F WB entering air temperature

All ratings based upon 208V operation

AHRI Data cont.

Energy Star Compliance Table

Model	Tier 3	
	Ground Water	Ground Loop
018	YES	YES
024	YES	YES
030	YES	YES
036	YES	YES
042	YES	YES
048	YES	YES
060	YES	YES
072	YES	YES

01/25/24

Energy Star Rating Criteria
In order for water-source heat pumps to be Energy Star rated they must meet or exceed the minimum efficiency requirements listed below. Tier 3 represents the current minimum efficiency water source heat pumps must have in order to be Energy Start rated.

Tier 3: 1/1/2012 – No Effective End Date Published

Water-to-Air	**EER**	**COP**
Ground Loop	17.1	3.6
Ground Water	21.1	4.1
Water-to-Water		
Ground Loop	16.1	3.1
Ground Water	20.1	3.5

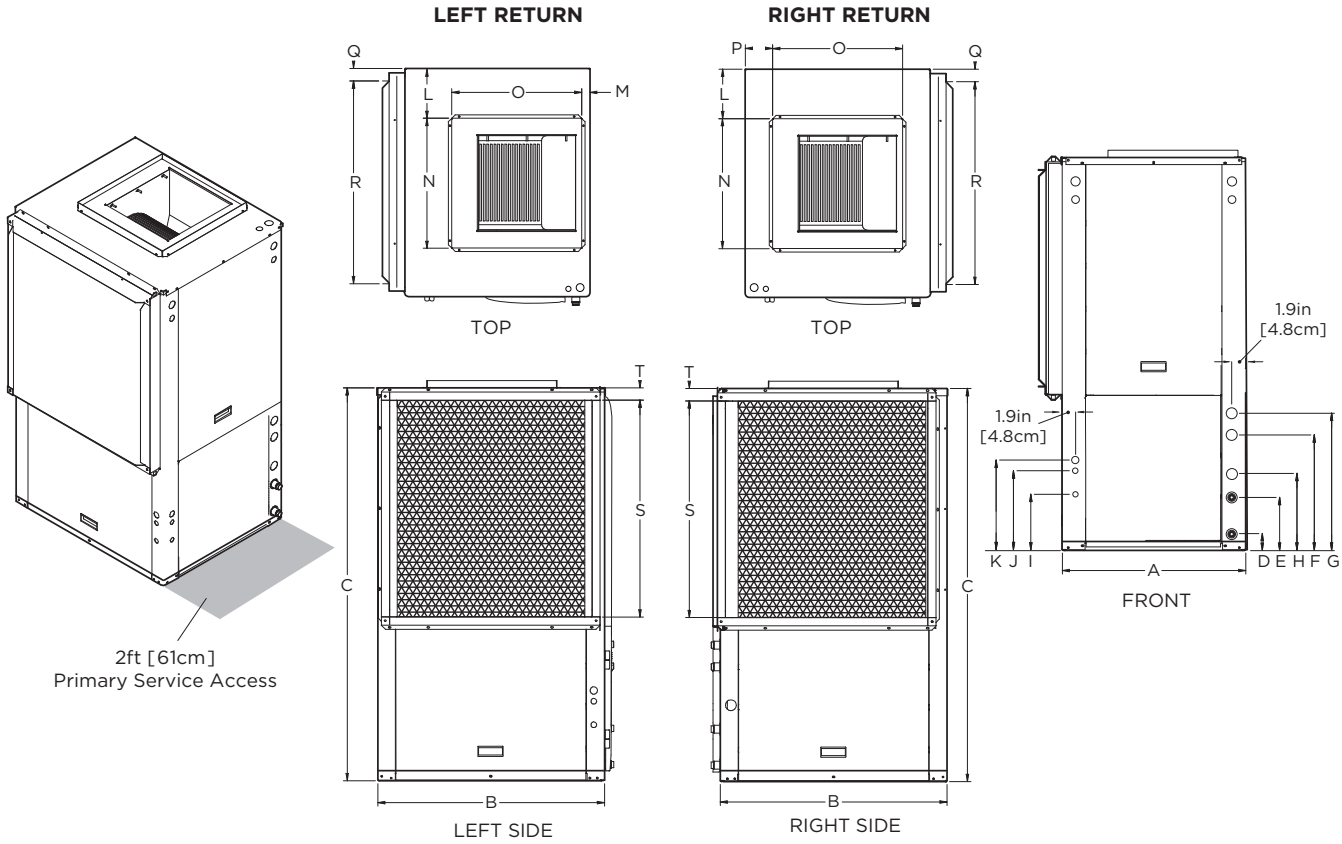
Physical Data

Model		018	024	030	036	042	048	060	072
Compressor (1 each)		Dual Capacity Scroll							
Factory Charge R-454B, oz [kg]	Vertical	32 [0.91]	50 [1.42]	56 [1.59]	54 [1.53]	56 [1.59]	62 [1.76]	76 [2.15]	104 [2.95]
Factory Charge R-454B, oz [kg]	Horizontal	36 [0.93]	48 [1.36]	54 [1.53]	54 [1.53]	62 [1.76]	72 [2.04]	84 [2.38]	104 [2.95]
Blower Motor & Blower									
Blower Motor Type/Speeds	VS ECM	Variable Speed ECM							
Blower Motor- hp [W]	VS ECM	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]
Blower Wheel Size (Dia x W), in. [mm]	VS ECM	9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
Coax and Water Piping									
Water Connections Size - Swivel - in [mm]		1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]
HWG Connection Size - Female Sweat I.D. - in [mm]		1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]
Coax & Piping Water Volume - gal [l]		0.40 [1.5]	0.7 [2.6]	1.0 [3.8]	1.3 [4.9]	1.3 [4.9]	1.6 [6.1]	1.6 [6.1]	2.3 [8.7]
Vertical									
Air Coil Dimensions (H x W), in. [mm]		19 x 20 [483 x 508]	24 x 20 [610 x 542]	28 x 20 [711 x 542]	28 x 25 [711 x 635]	32 x 25 [813 x 635]	32 x 25 [813 x 635]	36 x 25 [914 x 635]	36 x 25 [914 x 635]
Air Coil Total Face Area, ft2 [m2]		2.6 [0.242]	3.3 [0.310]	3.9 [0.362]	4.9 [0.451]	5.6 [0.570]	5.6 [0.570]	6.3 [0.641]	6.3 [0.641]
Air Coil Tube Size, in [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	5/16 [7.9]	5/16 [7.9]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	3	3	4	4	4	4
Filter Standard - 2" [51mm] Pleated MERV11 Throwaway, in [mm]		20 x 24 [508 x 610]	28 x 24 [712 x 610]	28 x 24 [712 x 610]	28 x 30 [712 x 762]	32 x 30 [813 x 762]	32 x 30 [813 x 762]	36 x 30 [914 x 762]	36 x 30 [914 x 762]
Weight - Operating, lb [kg]		200 [91]	293 [133]	308 [140]	353 [160]	368 [167]	408 [185]	443 [201]	468 [212]
Weight - Packaged, lb [kg]		220 [100]	313 [142]	328 [149]	373 [169]	388 [176]	428 [194]	463 [210]	488 [221]
Horizontal									
Air Coil Dimensions (H x W), in. [mm]		18 x 21 [457 x 533]	18 x 27 [457 x 686]	18 x 30 [457 x 762]	20 x 35 [508 x 889]	20 x 40 [508 x 1016]	20 x 40 [508 x 1016]	20 x 45 [508 x 1143]	20 x 45 [508 x 1143]
Air Coil Total Face Area, ft2 [m2]		2.6 [0.242]	3.4 [0.316]	3.9 [0.362]	4.9 [0.451]	5.6 [0.570]	5.6 [0.570]	6.3 [0.641]	6.3 [0.641]
Air Coil Tube Size, in [mm]		5/16 [7.9]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	3	3	3	3	4	4
Filter Standard - 2" [51mm] Pleated MERV11 Throwaway, in [mm]		1 - 18 x 24 [457 x 610]	1 - 18 x 32 [457 x 813]	1 - 18 x 32 [457 x 813]	1 - 20 x 37 [686 x 940]	1 - 20 x 20 [508 x 508] 1 - 20 x 22 [508 x 559]	1 - 20 x 20 [508 x 508] 1 - 20 x 22 [508 x 559]	1 - 20 x 25 [508 x 635] 1 - 20 x 22 [508 x 559]	1 - 20 x 25 [508 x 635] 1 - 20 x 22 [508 x 559]
Weight - Operating, lb [kg]		210 [95]	305 [138]	320 [145]	373 [169]	403 [183]	423 [191]	468 [212]	483 [219]
Weight - Packaged, lb [kg]		230 [104]	325 [152]	340 [154]	393 [178]	423 [192]	443 [101]	488 [221]	503 [228]

6/26/24

Dimensional Data

Top Air Discharge

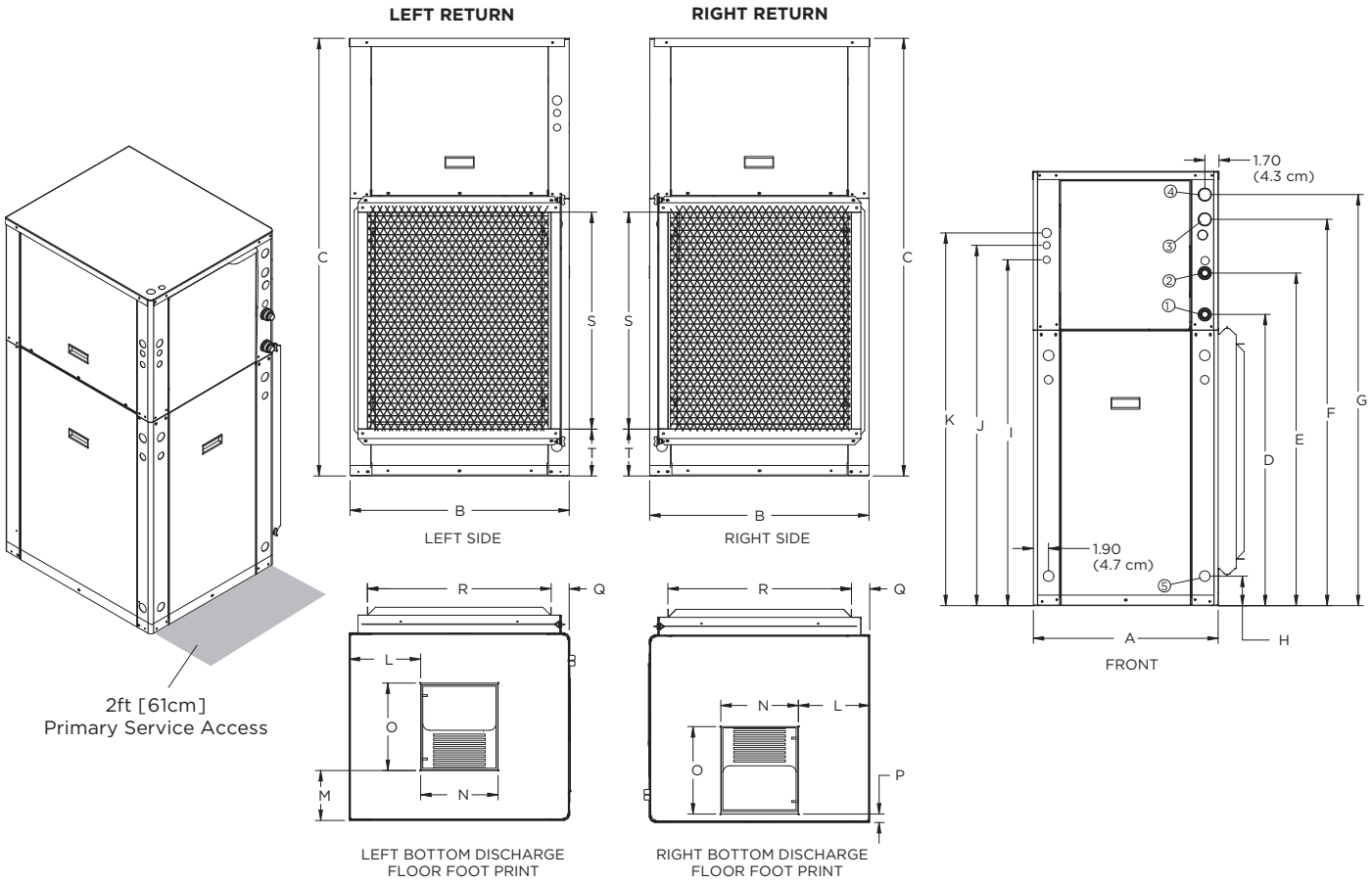


Vertical Top Flow Model		Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection duct flange installed (±0.10 in)					Return Connection using std deluxe filter rack (±0.10 in)			
												I 3/4" cond	J 1/2" cond	K 1/2" cond									
		A	B	C	D	E	F	G	H	Loop Water FPT	HWG (O.D.)				L	M	N	O	P	Q	R	S	T
		Width	Depth	Height	Loop In	Loop Out	HWG In	HWG Out	Cond-ensate			Power Supply	Ext Pump	Low Votage			Supply Width	Supply Depth			Return Depth	Return Height	
018	in.	22.5	26.5	39.4	2.3	5.3	13.4	16.4	9.6	1" Swivel	1/2" Stub	6.9	9.4	11.7	6.3	0.7	14.0	14.0	2.7	2.3	22.0	18.0	2.0
	cm.	57.2	67.3	100.1	5.8	13.5	34.0	41.7	24.4			17.5	23.9	29.7	16.0	1.8	35.6	35.6	6.9	5.8	55.9	45.7	5.1
024-030	in.	22.5	26.5	48.5	2.0	7.0	13.5	16.5	10.2	1" Swivel	1/2" Stub	9.5	12.1	14.3	6.1	0.8	14.0	14.0	4.4	1.7	22.2	26.0	1.7
	cm.	57.2	67.3	123.2	5.1	17.8	34.3	41.9	25.9			24.1	30.7	36.3	15.5	2.0	35.6	35.6	11.2	4.3	56.4	66.0	4.3
036	in.	25.6	31.6	50.4	2.3	7.3	15.9	18.9	10.6	1" Swivel	1/2" Stub	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	26.0	1.7
	cm.	65.0	80.3	128.0	5.8	18.5	40.4	48.0	26.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	66.0	4.3
042-048	in.	25.6	31.6	54.4	2.3	7.3	15.9	18.9	10.6	1" Swivel	1/2" Stub	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	30.0	1.7
	cm.	65.0	80.3	138.2	5.8	18.5	40.4	48.0	26.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	76.2	4.3
060-072	in.	25.6	31.6	58.4	2.3	7.3	15.9	18.9	10.6	1" Swivel	1/2" Stub	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	34.0	1.7
	cm.	65.0	80.3	148.3	5.8	18.5	40.4	48.0	26.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	86.4	4.3

Condensate is 3/4" PVC female glue socket and is switchable from side to front 1/25/24
Unit shipped with deluxe 2" (field adjustable to 1") duct collar/filter rack extending from unit 3.25" and is suitable for duct connection.
Discharge flange is field installed and extends 1" [25.4mm] from cabinet
Decorative molding and/or water connections extend 1.2" [30.5mm] beyond front of cabinet.

Dimensional Data cont.

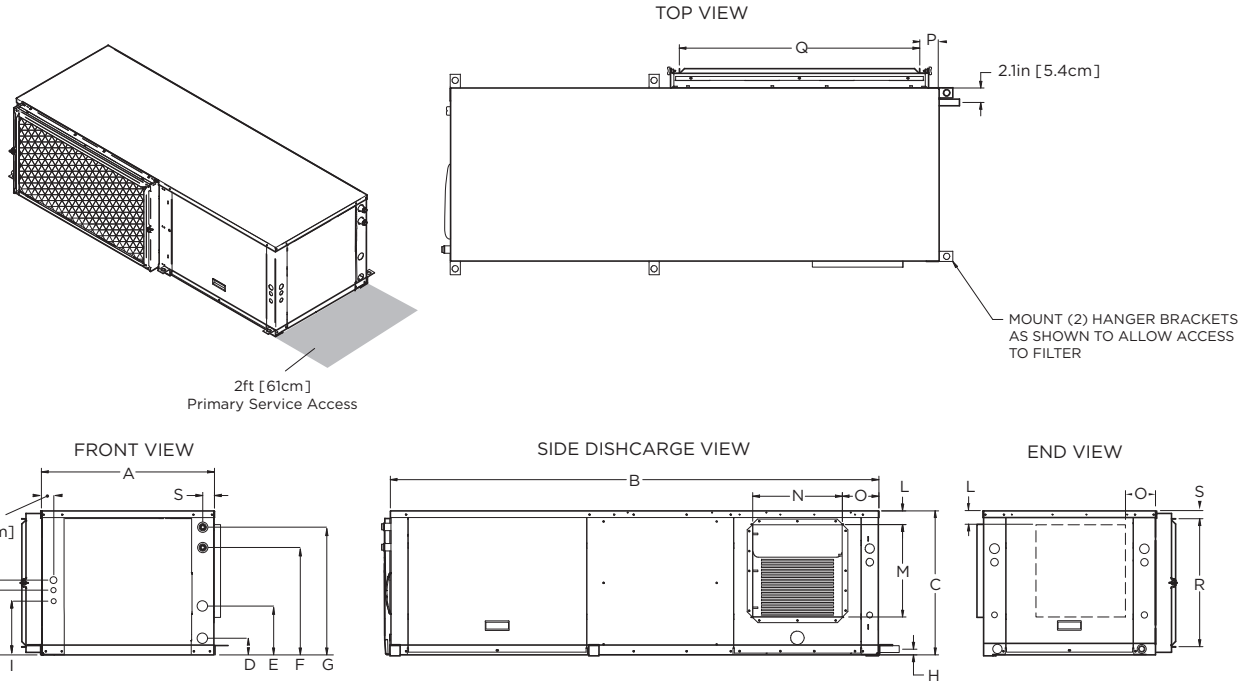
Bottom Air Discharge



Bottom Flow Models		Overall Cabinet			Water Connections							Electrical Knockouts			Discharge Connection duct flange installed (±0.10 in)					Return Connection using std deluxe filter rack (±0.10 in)			
					1	2	3	4	5			I 3/4 in. cond	J 1/2 in. cond	K 1/2 in. cond									
		A	B	C	D	E	F	G	H	Loop Water FPT	HWG (O.D.)	Power Supply	Ext Pump	Low Voltage	L	M	N	O	P	Q	R	S	T
		Width	Depth	Height	In	Out	HWG In	HWG Out	Con-densate								Supply Width	Supply Depth			Return Depth	Return Height	
024-030	in.	22.5	26.5	52.5	35.3	40.2	46.7	49.7	3.6	1 in. Swivel	1/2 in. Stub	41.9	43.6	45.1	8.6	6.0	9.3	10.5	1.0	2.2	22.2	26.0	5.6
	cm.	57.2	67.3	133.4	89.7	102.1	118.6	126.2	9.1			106.4	110.7	114.6	21.8	15.2	23.6	26.7	2.5	5.6	56.4	66.0	14.2
036-072	in.	25.5	31.5	62.5	43.4	48.4	57.0	60.0	3.6	1 in. Swivel	1/2 in. Stub	48.9	50.8	52.2	9.1	4.8	13.4	13.6	1.5	1.8	28.1	34.0	5.6
	cm.	64.8	80.0	158.8	110.2	122.9	144.8	152.4	9.1			124.2	129.0	132.6	23.1	12.2	34.0	34.5	3.8	4.6	71.4	86.4	14.2

Condensate is 3/4 in. PVC female glue socket and is switchable from side to front 7/11/12
Vertical bottom flow unit shipped with deluxe 2 in. (field adjustable to 1 in.) duct collar/filter rack extending from unit 3.25 in. and is suitable for duct connection.
Water connections extend 1.2 in. (30.5mm) beyond front of cabinet.
Top panel has 1.375 in. and 1.125 in. knockouts for electrical connections.

Dimensional Data cont.



AS SHOWN LR UNIT (RR UNIT ON OPPOSITE SIDE—SAME DIMENSIONS)

Horizontal Model		Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection duct flange installed (±0.10 in)				Return Connection using std deluxe filter rack (±0.10 in)			
		A	B	C	D	E	F	G	H	Loop Water FPT	HWG (O.D.)	I 3/4 in. cond	J 1/2 in. cond	K 1/2 in. cond	L	M	N	O	P	Q	R	S
		Width	Depth	Height	In	Out	HWG In	HWG Out	Cond-ensate			Power Supply	Ext Pump	Low Voltage		Supply Height	Supply Depth			Return Depth	Return Height	
018	in.	22.5	53.0	19.3	2.3	5.3	13.8	16.8	8.0	1 in. Swivel	1/2 in. Stub	6.9	9.5	11.7	1.8	10.5	9.5	8.2	2.2	21.8	16.5	1.5
	cm.	57.2	134.6	49.0	5.8	13.5	35.1	42.7	20.3			17.5	24.1	29.7	4.6	26.7	24.1	20.8	5.6	55.4	41.9	3.8
024-030	in.	22.5	63.0	19.3	2.0	7.0	13.5	16.5	0.8	1 in. Swivel	1/2 in. Stub	9.5	12.1	14.3	2.3	10.5	9.4	5.8	2.8	30.5	16.9	1.3
	cm.	57.2	160.0	49.0	5.1	17.8	34.3	41.9	2.0			24.1	30.7	36.3	5.8	26.7	23.9	14.7	7.1	77.5	42.9	3.3
036	in.	25.6	72.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in. Swivel	1/2 in. Stub	9.5	12.1	14.3	SEE	13.6	13.2	SEE	2.8	35.5	18.9	1.3
	cm.	65.0	182.9	54.1	5.8	18.5	40.4	48.0	2.0			24.1	30.7	36.3	CHART	34.5	33.5	CHART	7.1	90.2	48.0	3.3
042-048	in.	25.6	77.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in. Swivel	1/2 in. Stub	9.5	12.1	14.3	SEE	13.6	13.2	SEE	2.8	40.4	18.9	1.3
	cm.	65.0	195.6	54.1	5.8	18.5	40.4	48.0	2.0			24.1	30.7	36.3	CHART	34.5	33.5	CHART	7.1	102.6	48.0	3.3
060-072	in.	25.6	82.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in. Swivel	1/2 in. Stub	9.5	12.1	14.3	SEE	13.6	13.2	SEE	2.8	45.4	18.9	1.3
	cm.	65.0	208.3	54.1	5.8	18.5	40.4	48.0	2.0			24.1	30.7	36.3	CHART	34.5	33.5	CHART	7.1	115.3	48.0	3.3

Condensate is 3/4 in. PVC female glue socket and is switchable from side to front
Rev: 1/25/24
Unit shipped with deluxe 2 in. (field adjustable to 1 in.) duct collar/filter rack extending from unit 3.25 in. and is suitable for duct connection.
Discharge flange is field installed and extends 1 in. [25.4mm] from cabinet
Decorative molding and/or water connections extend 1.2 in. [30.5mm] beyond front of cabinet.

Units Not Shown Above		L	O
Right Return End Discharge	in	2.8	4.6
	cm	7.1	11.8
Right Return Side Discharge	in	4.9	6.9
	cm	12.4	17.5
Left Return End Discharge	in	4.9	7.6
	cm	12.4	19.4
Left Return Side Discharge	in	2.8	6.9
	cm	7.1	17.5

Electrical Data

Dual Capacity Unit with Variable Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA	LRA*						
018	208-230/60/1	187/253	15.0	9.6	52.0	18.2	0.4	5.4	4.0	19.4	21.8	35
024	208-230/60/1	187/253	16.0	10.2	62.0	21.7	0.4	5.4	4.0	20.0	22.6	35
030	208-230/60/1	187/253	22.7	14.5	82.0	28.7	0.4	5.4	4.0	24.3	28.0	40
036	208-230/60/1	187/253	22.7	14.5	90.0	32.4	0.4	5.4	4.0	24.3	28.0	40
042	208-230/60/1	187/253	28.4	18.2	106.0	37.1	0.4	5.4	4.0	28.0	32.5	50
048	208-230/60/1	187/253	28.6	18.3	138.0	49.7	0.4	5.4	4.0	28.1	32.7	50
060	208-230/60/1	187/253	39.3	25.2	147.3	51.5	0.4	5.4	7.0	38.0	44.2	70
072	208-230/60/1	187/253	43.7	28.0	160.0	56.0	0.4	5.4	7.0	40.8	47.8	70

*With optional IntelliStart 1/30/24
Rated Voltage of 208/230/60/1
HACR circuit breaker in USA only
All fuses Class RK-5

Auxiliary Heat Ratings

Model	KW		Stages	BTU/H		Min CFM				
	208V	230V		208V	230V		018	024 - 030	036 - 042	048 - 072
EAM(H)5	3.6	4.8	1	12,300	16,300	450	•	•		
EAM(H)8	5.7	7.6	2	19,400	25,900	550	•	•		
EAM(H)10	7.2	9.6	2	24,600	32,700	650		•		
EAL(H)10	7.2	9.6	2	24,600	32,700	1100			•	•
EAL(H)15	10.8	14.4	2	36,900	49,100	1250			•	•
EAL(H)20	14.4	19.2	2	49,200	65,500	1500				•

Order the "H" part number when installed on horizontal and vertical rear discharge units 01/25/24
Air flow level for auxiliary heat (Aux) must be equal to or above the minimum CFM in this table

Auxiliary Heat Electrical Data

Model	Supply Circuit	Heater Amps		Min Circuit Amp		Fuse (USA)		Fuse (CAN)		CKT BRK	
		208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V
EAM(H)5*	Single	17.3	20.0	26.7	30.0	30	30	30	30	30	30
EAM(H)8*	Single	27.5	31.7	39.3	44.6	40	45	40	45	40	45
EAM(H)10*	Single	34.7	40.0	48.3	55.0	50	60	50	60	50	60
EAL(H)10*	Single	34.7	40.0	53.3	60.0	60	60	60	60	60	60
EAL(H)15*	Single	52.0	60.0	75.0	85.0	80	90	80	90	70	100
	L1/L2	34.7	40.0	53.3	60.0	60	60	60	60	60	60
	L3/L4	17.3	20.0	21.7	25.0	25	25	25	25	20	30
EAL(H)20*	Single	69.3	80.0	96.7	110.0	100	110	100	110	100	100
	L1/L2	34.7	40.0	53.3	60.0	60	60	60	60	60	60
	L3/L4	34.7	40.0	43.3	50.0	45	50	45	50	40	50

All heaters rated single phase 60 cycle and include unit fan load 01/25/24
All fuses type "D" time delay (or HACR circuit breaker in USA)
Supply wire size to be determined by local codes

Blower Performance Data

Dual Capacity ECM Blower Table

MODEL	MAX ESP	AIR FLOW SPEED SETTINGS											
		1	2	3	4	5	6	7	8	9	10	11	12
018	**0.50**	300	400 G	**500**	**600** **L**	**700** **H**	**800**	**875**	950	1025	1125 Aux		
024	**0.50**		400	500 G	600	**700** **L**	**800**	**900** **H**	**1000**	1100	1200 Aux		
030	**0.50**		400	500 G	600	**700** **L**	**800**	**900** **H**	**1000**	**1100**	1200 Aux		
036	**0.50**	650	750 G	850	1000	**1100** **L**	**1200**	**1300** **H**	**1400**	**1500**	1550 Aux		
042	**0.50**	650	800	900 G	1050	**1150** **L**	**1250**	**1350**	**1450** **H**	**1550**	1600 Aux		
048	**0.50**	650	800 G	900	1050	1150	**1250**	**1350** **L**	**1450**	**1550** **H**	1575 Aux		
060	**0.75**	800	950 G	1100	1300	**1500** **L**	**1750**	**1950** **H**	**2100**	**2300**	2325 Aux		
072	**0.75**	800	950	1100 G	1300	**1500**	**1750** **L**	**1950**	**2100** **H**	**2300**	2325 Aux		

1/25/24

Factory settings are at recommended G-L-H-Aux speed settings
L-H settings MUST be located within boldface CFM range
"Aux" is factory setting for auxiliary heat and must be equal to or above the "H" setting as well as at least the minimum required for the auxiliary heat package
"G" may be located anywhere within the airflow table
CFM is controlled within ±5% up to the maximum ESP
Max ESP includes allowance for wet coil and standard filter

Blower Performance Data cont.

Setting Blower Speed - Variable Speed ECM

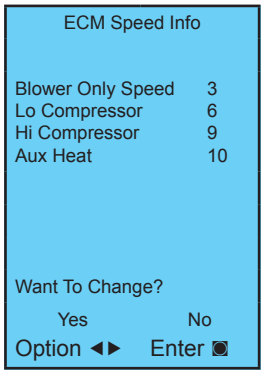
The ABC board's Yellow Config LED will flash the current ECM blower speed selections for "G", low, and high continuously with a short pause in between. The speeds can also be confirmed with the AID Tool under the Setup/ ECM Setup screen. The Aux will not be flashed but can be viewed in the AID Tool. The ECM blower motor speeds can be field adjusted with or without using an AID Tool.

ECM Setup without an AID Tool

The blower speeds for "G", Low (Y1), High (Y2), and Aux can be adjusted directly at the Aurora ABC board which utilizes the push button (SW1) on the ABC board. This procedure is outlined in the ECM Configuration Mode portion of the Aurora 'Base' Control System section. The Aux cannot be set manually without an AID Tool.

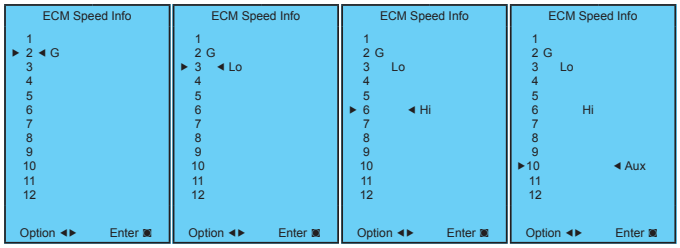
ECM Setup with an AID Tool

A much easier method utilizes the AID Tool to change the airflow using the procedure below. First navigate to the Setup screen and then select ECM Setup. This screen displays the current ECM settings. It allows the technician to enter the setup screens to change the ECM settings. Change the highlighted item using the ◄ and ► buttons and then press the ◙ button to select the item.



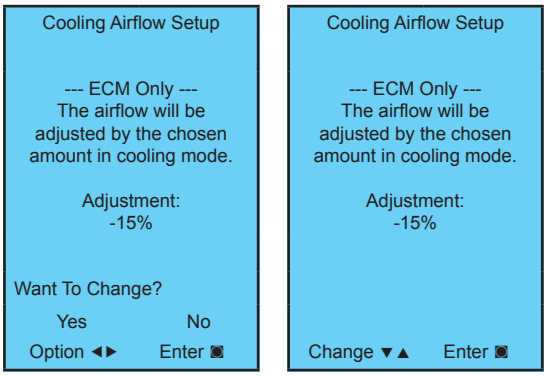
Selecting YES will enter ECM speed setup, while selecting NO will return to the previous screen.

ECM Speed Setup - These screens allow the technician to select the "G", low, high, and auxiliary heat blower speed for the ECM blower motor. Change the highlighted item using the ▲ and ▼ buttons. Press the ◙ button to select the speed.



After the auxiliary heat speed setting is selected the AID Tool will automatically transfer back to the ECM Setup screen.

Cooling Airflow Setup - These screens allow the technician to select -15%, -10%, -5%, None or +5%. Change the adjustment percentage using the ▲ and ▼ buttons. Press the ◙ button to save the change.



Antifreeze Corrections

Catalog performance can be corrected for antifreeze use. Please use the following table and note the example given.

Antifreeze Type	Antifreeze % by wt	Heating	Cooling	Pressure Drop
EWT - °F [°C]		**30 [-1.1]**	**90 [32.2]**	**30 [-1.1]**
Water	0	1.000	1.000	1.000
Ethylene Glycol	10	0.973	0.991	1.075
	20	0.943	0.979	1.163
	30	0.917	0.965	1.225
	40	0.890	0.955	1.324
	50	0.865	0.943	1.419
Propylene Glycol	10	0.958	0.981	1.130
	20	0.913	0.969	1.270
	30	0.854	0.950	1.433
	40	0.813	0.937	1.614
	50	0.770	0.922	1.816
Ethanol	10	0.927	0.991	1.242
	20	0.887	0.972	1.343
	30	0.856	0.947	1.383
	40	0.815	0.930	1.523
	50	0.779	0.911	1.639
Methanol	10	0.957	0.986	1.127
	20	0.924	0.970	1.197
	30	0.895	0.951	1.235
	40	0.863	0.936	1.323
	50	0.833	0.920	1.399

WARNING: Gray area represents antifreeze concentrations greater than 35% by weight and should be avoided due to the extreme performance penalty they represent.

Antifreeze Correction Example

Antifreeze solution is Propylene Glycol 20% by weight. Determine the corrected heating and cooling performance at 30°F and 90°F respectively as well as pressure drop at 30°F for a 024-ECM.

The corrected cooling capacity at 90°F would be: 22,900 MBtu/h x 0.969 = 22,190 MBtu/h

The corrected heating capacity at 30°F would be: 18,900 MBtu/h x 0.913 = 17,255 MBtu/h

The corrected pressure drop at 30°F and 6 gpm would be: 7.4 feet of head x 1.270 = 9.39 feet of head

Correction Factor Tables

Air Flow Corrections (Dual Capacity Part Load)

Airflow		Cooling				Heating		
cfm Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.922	0.778	0.956	0.924	0.943	1.239	0.879
275	69	0.944	0.830	0.962	0.944	0.958	1.161	0.914
300	75	0.957	0.866	0.968	0.958	0.968	1.115	0.937
325	81	0.970	0.900	0.974	0.970	0.977	1.075	0.956
350	88	0.982	0.933	0.981	0.980	0.985	1.042	0.972
375	94	0.991	0.968	0.991	0.991	0.993	1.018	0.988
400	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106	1.007	1.033	1.011	1.008	1.007	0.990	1.010
450	113	1.013	1.065	1.023	1.015	1.012	0.987	1.018
475	119	1.017	1.099	1.037	1.022	1.018	0.984	1.025
500	125	1.020	1.132	1.052	1.027	1.022	0.982	1.031
520	130	1.022	1.159	1.064	1.030	1.025	0.979	1.034

5/30/06

Air Flow Corrections (Dual Capacity Full Load and Single Speed)

Airflow		Cooling				Heating		
cfm Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.922	0.786	0.910	0.920	0.943	1.150	0.893
275	69	0.944	0.827	0.924	0.940	0.958	1.105	0.922
300	75	0.959	0.860	0.937	0.955	0.968	1.078	0.942
325	81	0.971	0.894	0.950	0.967	0.977	1.053	0.959
350	88	0.982	0.929	0.964	0.978	0.985	1.031	0.973
375	94	0.992	0.965	0.982	0.990	0.993	1.014	0.988
400	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106	1.007	1.034	1.020	1.010	1.007	0.990	1.011
450	113	1.012	1.065	1.042	1.018	1.013	0.983	1.020
475	119	1.017	1.093	1.066	1.026	1.018	0.980	1.028
500	125	1.019	1.117	1.092	1.033	1.023	0.978	1.034
520	130	1.020	1.132	1.113	1.038	1.026	0.975	1.038

5/30/06

Cooling Capacity Corrections

Entering Air WB °F	Total Clg Cap	Sensible Cooling Capacity Multipliers - Entering DB °F										Power Input	Heat of Rejection
		60	65	70	75	80	80.6	85	90	95	100		
55	0.898	0.723	0.866	1.048	1.185	*	*	*	*	*	*	0.985	0.913
60	0.912		0.632	0.880	1.078	1.244	1.260	*	*	*	*	0.994	0.927
63	0.945			0.768	0.960	1.150	1.175	*	*	*	*	0.996	0.954
65	0.976			0.694	0.881	1.079	1.085	1.270	*	*	*	0.997	0.972
66.2	0.983			0.655	0.842	1.040	1.060	1.232	*	*	*	0.999	0.986
67	**1.000**			0.616	0.806	**1.000**	1.023	1.193	1.330	1.480	*	**1.000**	**1.000**
70	1.053				0.693	0.879	0.900	1.075	1.205	1.404	*	1.003	1.044
75	1.168					0.687	0.715	0.875	1.040	1.261	1.476	1.007	1.141

NOTE: * Sensible capacity equals total capacity at conditions shown.

3/28/12

Heating Capacity Corrections

Ent Air DB °F	Heating Corrections		
	Htg Cap	Power	Heat of Ext
45	1.062	0.739	1.158
50	1.050	0.790	1.130
55	1.037	0.842	1.096
60	1.025	0.893	1.064
65	1.012	0.945	1.030
68	1.005	0.976	1.012
70	**1.000**	**1.000**	**1.000**
75	0.987	1.048	0.970
80	0.975	1.099	0.930

11/10/09

Heat of Extraction/Heat of Rejection

Model		GPM	Heat of Extraction (kBtuh)				Heat of Rejection (kBtuh)				
			30°F	50°F	70°F	90°F	30°F	50°F	70°F	90°F	110°F
018	Part Load	2.0		10.1	13.0	15.2		16.7	17.2	16.4	
		3.0	7.5	10.6	13.1	16.2	16.8	16.9	17.3	16.6	15.6
		3.0	7.7	10.9	14.1	16.8	16.9	17.0	17.4	16.7	15.7
	Full Load	4.0		13.8	18.1	20.7		22.8	22.5	21.9	
		5.0	10.9	14.4	18.4	22.1	23.2	23.0	22.6	22.4	21.0
		6.0	11.1	14.8	19.0	22.9	23.4	23.2	22.8	22.5	21.1
024	Part Load	3.0		11.9	15.4	17.5		21.3	21.2	20.1	
		5.0	9.4	12.4	15.6	18.7	20.7	21.6	21.3	20.5	20.0
		7.0	9.6	12.7	16.1	19.4	20.8	21.7	21.6	20.6	20.1
	Full Load	4.0		16.5	18.0	23.6		29.8	29.6	28.7	
		6.0	13.4	17.2	21.4	25.2	28.2	29.9	29.7	29.1	27.4
		8.0	13.7	17.6	22.1	26.1	28.4	30.1	29.8	29.3	27.5
030	Part Load	5.0		17.0	21.7	27.3		30.2	29.0	27.5	
		6.0	11.6	17.7	222.3	29.1	27.0	30.6	29.2	28.1	26.3
		7.0	11.9	18.2	22.4	30.1	27.2	30.9	29.3	28.2	26.4
	Full Load	6.0		23.6	32.3	38.6		41.2	39.8	37.4	
		7.0	18.0	24.6	32.8	41.1	38.8	41.6	40.1	38.1	36.8
		8.0	18.4	25.2	33.3	42.6	39.1	41.9	43.1	38.3	37.0
036	Part Load	4.0		17.6	21.2	30.8		35.5	34.0	31.8	
		6.0	14.6	18.4	22.3	32.8	31.6	35.9	34.1	32.4	30.9
		8.0	14.9	18.9	22.9	34.0	31.9	36.2	34.4	32.6	31.0
	Full Load	5.0		27.0	34.5	41.8		49.3	46.5	44.1	
		7.0	21.5	28.2	36.1	44.6	37.0	49.9	46.7	45.0	42.9
		9.0	22.0	29.9	37.2	46.2	37.3	50.2	47.1	45.2	43.1
042	Part Load	4.0		22.2	29.3	37.8		39.2	38.2	37.7	
		6.0	16.3	23.2	31.4	40.0	34.8	39.9	38.6	37.8	33.6
		8.0	17.6	24.4	32.3	41.0	35.1	40.5	39.1	38.3	33.9
	Full Load	5.0		32.6	40.0	44.0		52.4	54.7	52.0	
		8.0	25.5	34.0	43.6	47.0	45.2	52.9	55.2	53.1	50.4
		11.0	26.1	34.9	45.0	48.6	45.6	53.3	55.3	53.5	50.6
048	Part Load	5.0		26.0	32.6	43.4		44.8	45.5	43.6	
		8.0	18.0	27.2	36.3	46.1	37.3	45.4	45.6	42.7	40.3
		11.0	19.5	28.6	37.3	46.2	37.6	46.0	46.2	44.2	40.7
	Full Load	6.0		36.4	45.0	51.1		60.1	59.5	55.9	
		9.0	27.7	38.0	47.7	54.5	50.9	60.7	59.6	56.9	53.1
		12.0	28.4	39.0	49.2	56.8	51.2	61.1	59.9	57.2	53.3
060	Part Load	6.0		31.2	43.0	54.9		55.1	53.0	51.2	
		10.0	21.2	32.7	45.1	57.8	50.5	55.5	53.5	51.4	48.1
		14.0	23.0	34.4	46.3	58.3	50.9	56.3	54.1	51.8	48.5
	Full Load	8.0		42.4	59.0	73.0		70.2	75.2	72.4	
		12.0	27.0	44.3	63.7	77.6	60.9	77.9	75.9	72.5	70.0
		16.0	29.2	46.7	65.4	77.8	61.3	78.9	76.2	73.3	70.7
072	Part Load	10.0		37.9	52.5	65.4		64.5	65.8	63.4	
		13.0	26.4	39.6	54.1	69.5	56.8	69.2	66.2	63.6	61.0
		16.0	28.6	41.7	55.5	70.1	57.3	70.1	66.6	64.3	61.6
	Full Load	12.0		52.6	71.0	83.3		88.5	89.5	85.8	
		15.0	39.6	54.9	72.5	88.9	73.7	89.2	89.9	87.4	83.6
		18.0	40.6	56.3	74.9	92.1	74.1	89.8	90.1	87.7	83.9

Note: operation not recommended in shaded areas.

2/1/24

Water Quality

Material		Copper	90/10 Cupronickel	316 Stainless Steel
pH	**Acidity/Alkalinity**	7 - 9	7 - 9	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than 0.5 ppm (rotten egg smell appears at 0.5 ppm)	10 - 50 ppm	Less than 1 ppm
	Sulfates	Less than 125 ppm	Less than 125 ppm	Less than 200 ppm
	Chlorine	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Chlorides	Less than 20 ppm	Less than 125 ppm	Less than 300 ppm
	Carbon Dioxide	Less than 50 ppm	10 - 50 ppm	10 - 50 ppm
	Ammonia	Less than 2 ppm	Less than 2 ppm	Less than 20 ppm
	Ammonia Chloride	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Nitrate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Hydroxide	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Sulfate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000 - 1500 ppm	1000 - 1500 ppm
	LSI Index	+0.5 to -0.5	+0.5 to -0.5	+0.5 to -0.5
Iron Fouling (Biological Growth)	Iron, FE^{2}+ (Ferrous) Bacterial Iron Potential	< 0.2 ppm	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur
Erosion	Suspended Solids	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size
	Threshold Velocity (Fresh Water)	< 6 ft/sec	< 6 ft/sec	< 6 ft/sec

NOTES: Grains = ppm divided by 17
mg/L is equivalent to ppm

2/22/12

Water Quality

It is the responsibility of the system designer and installing contractor to ensure that acceptable water quality is present and that all applicable codes have been met in these installations. Failure to adhere to the guidelines in the water quality table could result in loss of warranty. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, a closed loop system is recommended. The heat exchanger coils in ground water systems may, over a period of time, lose heat exchange capabilities due to a buildup of mineral deposits inside. These can be cleaned, but only by a qualified service mechanic, as special solutions and pumping equipment are required. Hot water generator coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional flushing.

Heat pumps with cupronickel heat exchangers are recommended for open loop applications due to the increased resistance to build-up and corrosion, along with reduced wear caused by acid cleaning.

Water Treatment

Do not use untreated or improperly treated water. Equipment damage may occur. The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. Purchase of a pre-mix antifreeze could significantly improve system reliability if the water quality is controlled and there are additives in the mixture to inhibit corrosion. There are many examples of such fluids on the market today such as Environol™ 1000 (pre-mix ethanol), and others. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The product warranty specifically excludes liability for corrosion, erosion or deterioration of equipment.

The heat exchangers and water lines in the units are copper or cupronickel tube. There may be other materials in the buildings piping system that the designer may need to take into consideration when deciding the parameters of the water quality. If antifreeze or water treatment solution is to be used, the designer should confirm it does not have a detrimental effect on the materials in the system.

Contaminated Water

In applications where the water quality cannot be held to prescribed limits, the use of a secondary or intermediate heat exchanger is recommended to separate the unit from the contaminated water. The table above outlines the water quality guidelines for unit heat exchangers. If these conditions are exceeded, a secondary heat exchanger is required. Failure to supply a secondary heat exchanger where needed will result in a warranty exclusion for primary heat exchanger corrosion or failure.

Operating Parameters

Dual Capacity Models

First Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	105 - 120	140 - 155	20 - 35	9 - 17	17 - 21	17 - 23
	3.0	100 - 115	115 - 130	20 - 35	9 - 17	8 - 12	17 - 23
50	1.5	125 - 140	205 - 225	12 - 20	8 - 14	17 - 21	17 - 23
	3.0	115 - 135	170 - 200	12 - 20	8 - 14	8 - 12	17 - 23
70	1.5	135 - 145	280 - 290	10 - 16	8 - 14	16 - 20	17 - 23
	3.0	125 - 143	230 - 270	10 - 16	8 - 14	9 - 13	17 - 23
90	1.5	142 - 152	345 - 355	8 - 12	8 - 14	14 - 20	17 - 23
	3.0	135 - 150	300 - 340	8 - 12	8 - 14	8 - 12	17 - 23
110	1.5	152 - 158	405 - 435	8 - 12	8 - 14	14 - 20	17 - 23
	3.0	135 - 153	390 - 420	8 - 12	8 - 14	8 - 12	17 - 23

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	76 - 84	270 - 285	8 - 12	3 - 10	5 - 9	12 - 16
	3.0	750- 88	275 - 295	8 - 12	3 - 10	3 - 7	14 - 18
50	1.5	100 - 115	280 - 310	10 - 14	3 - 10	7 - 11	18 - 22
	3.0	105 - 120	295 - 325	10 - 14	3 - 10	5 - 9	20 - 24
70	1.5	135 - 150	310 - 325	12 - 16	3 - 10	8 - 12	24 - 28
	3.0	140 - 155	330 - 370	12 - 16	3 - 10	6 - 10	22 - 30
90	1.5	155 - 165	330 - 370	12 - 16	3 - 10	8 - 12	24 - 28
	3.0	165 - 175	380 - 410	12 - 16	3 - 10	6 - 10	22 - 30
110	1.5						
	3.0						

Note: Cooling performance based on entering air temperatures of 80º F DB, 67º F WB.
Heating performance based on entering air temperature of 70º F DB.

Second Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	115 - 125	150 - 170	20 - 35	10 - 17	17 - 22	17 - 23
	3.0	95 - 120	125 - 145	20 - 35	10 - 17	8 - 10	17 - 23
50	1.5	130 - 140	215 - 235	12 - 20	8 - 14	16 - 22	17 - 23
	3.0	120 - 138	170 - 210	12 - 20	8 - 14	8 - 12	17 - 23
70	1.5	138 - 148	280 - 310	10 - 16	10 - 16	15 - 21	17 - 23
	3.0	135 - 146	250 - 280	10 - 16	8 - 14	7 - 13	17 - 23
90	1.5	145 - 155	350 - 380	9 - 14	10 - 16	14 - 20	17 - 23
	3.0	135 - 153	300 - 350	9 - 14	8 - 14	6 - 10	17 - 23
110	1.5	145 - 155	420 - 450	9 - 14	10 - 16	14 - 20	17 - 23
	3.0	135 - 153	390 - 435	9 - 14	8 - 14	6 - 10	17 - 23

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	73 - 85	270 - 305	8 - 14	3 - 10	6 - 10	15 - 21
	3.0	77 - 90	280 - 315	8 - 14	3 - 10	4 - 8	17 - 23
50	1.5	97 - 110	290 - 325	10 - 16	3 - 10	9 - 13	22 - 28
	3.0	102 - 115	300 - 335	10 - 16	3 - 10	7 - 11	24 - 30
70	1.5	130 - 145	320 - 355	13 - 19	3 - 10	10 - 14	30 - 36
	3.0	135 - 150	325 - 360	13 - 19	3 - 10	8 - 12	32 - 38
90	1.5	150 - 160	350 - 390	13 - 19	3 - 10	10 - 14	30 - 36
	3.0	155 - 165	365 - 405	13 - 19	3 - 10	8 - 12	32 - 38
110	1.5						
	3.0						

Note: Cooling performance based on entering air temperatures of 80º F DB, 67º F WB. 2/5/24
Heating performance based on entering air temperature of 70º F DB.

Pressure Drop

Dual Capacity Pressure Drop

Model	GPM	Pressure Drop (psi)					Model	GPM	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F			30°F	50°F	70°F	90°F	110°F
018 full load	3	1.8	1.7	1.6	1.5	1.4	**042 full load**	5	1.5	1.4	1.3	1.2	1.1
	4	3.3	3.1	2.9	2.7	2.5		8	3.5	3.3	3.1	2.9	2.7
	5	4.8	4.5	4.2	3.9	3.6		11	5.6	5.2	4.9	4.6	4.2
	6	6.0	5.8	5.5	5.3	5.2		14	7.5	7.1	6.7	6.3	5.7
018 part load	2	1.8	1.7	1.6	1.5	1.4	**042 part load**	4	0.9	0.9	0.8	0.7	0.7
	3	3.3	3.1	2.9	2.7	2.5		6	2.0	1.9	1.8	1.7	1.6
	4	4.8	4.5	4.2	3.9	3.6		8	3.2	3.0	2.8	2.6	2.4
	5	4.2	4.2	4.1	4.0	3.9		9	4.2	4.1	3.8	3.5	3.2
024 full load	4	1.4	1.3	1.2	1.1	1.0	**048 full load**	6	1.4	1.3	1.2	1.1	1.0
	6	3.2	3.0	2.8	2.6	2.4		9	2.7	2.6	2.4	2.3	2.1
	8	5.1	4.8	4.5	4.2	3.9		12	4.1	3.8	3.6	3.5	3.1
	10	7.0	6.6	6.2	5.8	5.3		15	5.3	4.9	4.5	4.3	4.1
024 part load	3	0.8	0.7	0.7	0.7	0.6	**048 part load**	5	1.1	1.1	0.9	0.8	0.7
	5	2.4	2.2	2.0	2.1	1.8		8	2.3	2.1	2.1	1.9	1.7
	7	4.0	3.7	3.3	3.2	3.0		11	3.5	3.3	3.1	2.9	2.7
	9	5.8	5.5	5.1	4.8	4.4		14	4.7	4.5	4.1	3.9	3.7
030 full load	4	1.3	1.2	1.2	1.1	1.0	**060 full load**	8	2.6	2.5	2.3	2.1	2.0
	6	2.6	2.5	2.3	2.1	2.0		12	4.8	4.5	4.2	3.9	3.6
	8	4.2	4.0	3.7	3.4	2.9		16	7.0	6.6	6.2	5.8	5.4
	10	6.8	6.3	5.4	5.4	5.0		20	9.2	8.5	8.0	7.7	7.2
030 part load	4	1.3	1.2	1.2	1.1	1.0	**060 part load**	6	1.8	1.7	1.6	1.5	1.4
	6	2.6	2.5	2.3	2.1	2.0		10	3.6	3.4	3.2	3.0	2.8
	7	3.4	3.2	3.0	2.8	2.6		14	5.6	5.2	4.9	4.6	4.2
	8	4.2	4.0	3.7	3.4	2.9		18	8.6	8.0	7.6	7.2	6.6
036 full load	5	1.2	1.2	1.1	1.0	1.0	**072 full load**	12	3.2	3.0	2.8	2.6	2.4
	7	2.7	3.6	2.4	2.2	2.1		15	4.5	4.2	4.0	3.7	3.4
	9	3.9	3.6	3.4	3.2	2.9		18	6.0	5.7	5.3	4.9	4.6
	11	5.2	4.9	4.7	4.5	4.2		21	7.8	7.3	6.8	6.4	5.9
036 part load	4	1.1	1.1	1.0	0.9	0.9	**072 part load**	10	2.3	2.1	2.0	1.9	1.7
	6	2.4	2.2	2.1	2.0	1.8		13	3.4	3.2	3.0	2.8	2.6
	8	3.7	3.5	3.2	3.0	2.8		16	4.9	4.6	4.3	4.0	3.7
	10	5.0	4.8	4.5	4.3	3.9		19	6.4	6.2	5.8	5.4	5.0

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Operation Logic Data Table

Operation Logic Table	Heating					Cooling		
	STG1	**STG2**	**STG3**	**EMERG**	**Fan Only**	**STG1**	**STG2**	**Fan Only**
Compressor	On	On	On	Off	Off	On	On	Off
Reversing Valve	Off	Off	Off	Off	Off	On	On	On
Aux Heat	Off	Off	Staged	Staged	Off	Off	Off	Off
Acc Relay	On	On	On	Off	Off	On	On	Off
ECM Speed	Med	High	High	High	Low	Med	High	Low
T-Stat Signal	Y1	Y1,Y2	Y1,Y2,W	W	G	Y1,O	Y1,Y2,O	G

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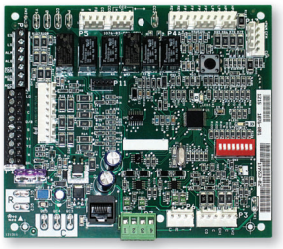
Aurora Control System

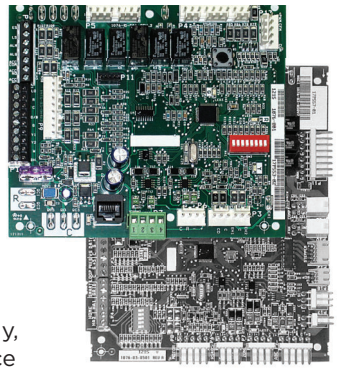
Aurora 'Base' Control



The Aurora 'Base' Control (ABC) System is a complete residential and commercial comfort system that brings all aspects of the HVAC system into one cohesive module network. The ABC features microprocessor control and HP, LP, condensate and freeze detection, over/under voltage faults, along with communicating thermostat capability for complete fault detection text at the thermostat.

Aurora uses the Modbus communication protocol to communicate between modules. Each module contains the logic to control all features that are connected to the module. The Aurora 'Base' Control (ABC) has two Modbus channels. The first channel is configured as a master for connecting to devices such as a communicating thermostat, expansion board, or other slave devices. The second channel is configured as a slave for connecting the Aurora Interface Diagnostics Tool (AID Tool).

Aurora 'Advanced' Control



The Aurora 'Advanced' Control expands on the capability of the Aurora 'Base' Control (ABC) System by adding the Aurora Expansion Board (AXB). The additional features include compressor current monitoring, loop pump slaving, intelligent hot water generator control, variable speed pump capability, and also allows for optional energy, refrigeration, and performance monitoring factory installed add-on sensor kits. The AXB also features a second field configurable accessory relay, and two home automation inputs that are AID configurable for different types of alarms from sump pumps to home security. The Smart Grid input is AID configurable with many options to react to Utility controlled relay operation for ON Peak optimization. The AXB also expands the communication capability for IntelliZone2 ready operation as well as other expansion with the ClimateTalk protocol.

Aurora Control Features	Description	Aurora 'Advanced'
Microprocessor Compressor Control	Microprocessor control of compressor for timings with FP1, HP, LP, Condensate, assignable Acc relay	•
Advanced Microprocessor Features	Smart Grid, Home Automation Alarm Inputs, and Accessory2 Relay (HRV/ERV)	•
Advanced Hot Water Generator Control	Microprocessor and separate power relay for Hot Water Generator Pump with digital temperature monitoring and multiple HWG setpoint selection.	•
Advanced Speed Pump Control	Microprocessor and separate power relay for loop pump and inline circuit breakers and loop pump slaving.	•
Variable Speed Pump	Capable of setup, monitoring and controlling a variable speed flow center.	•
Compressor Monitoring	Control monitors compressor starts for high current, missing let etc.	•
Smart Grid/Utility Input	Allows simple input to externally enable of occupied/unoccupied mode for basic utility time of use programs.	Dry Contact x1
Home Automation Alarm Input	Allows simple input to signal sump, security, or smoke/CO sensor alarms from other home automation or security systems. The two inputs can be field configured to a number of options and logic.	Dry Contactx2
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, Home Automation Network and Internet.	Optional AWL
IntelliZone2® Compatibility	IntelliZone2 communicates Modbus to the heat pump via the AXB board.	Optional IntelliZone2

Aurora Control System

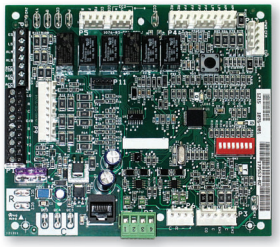
Service Device	Description	Aurora 'Advanced'
 **Aurora Interface and Diagnostics (AID) Tool**	Allows setup, monitoring and troubleshooting of any Aurora Control. **NOTE:** Although the ABC has basic compatibility with all Aurora, new product features may not be available on older AID Tools. To simplify the basic compatibility ensure the version of AID is at least the same or greater than the ABC software version.	For Service (Ver. 2.20 or greater)

Add On Control Feature Kits	Description	Aurora 'Advanced'
Data Logging (AWL) Kit	Allows data logging of up to 12 months. Can also be temporarily installed.	Optional
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, HAN, and internet.	Optional

Add On Thermostats and Zoning	Description	Aurora Advanced
 **TP32U03/04 - MonoChrome Traditional Y1, Y2 Thermostat**	Elite Stat with full English fault codes and alerts, traditional Y1, Y2 thermostat. Not compatible with AWL.	Optional
 **TP32S01/02 - Traditional Y1, Y2 Thermostat**	Traditional Y1, Y2 thermostat. Not compatible with AWL.	Optional
 **TPCM32U03A/04A - MonoChrome Communicating Thermostat**	Elite Stat with full English fault codes and alerts, communicating thermostat. Monochrome thermostat allows instantaneous energy measurement only. Compatible with AWL.	Optional
 **TPCC Series Color Touchscreen Thermostat**	4.3 in. color touchscreen communicating thermostat with full English fault codes and alerts. Color thermostat allows instantaneous energy measurement and 13 month energy usage history. Compatible with AWL.	Optional
 **IntelliZone2® Zoning**	IntelliZone2® is a communicating zoning system that includes color main thermostat and up to 6 zones (with variable speed, 4 zones (with dual capacity), and 2 zones (with single speed). There are 3 thermostat options (MasterStat, SensorStat, ZoneStat). Compatible with AWL.	Optional (IntelliZone2 Preferred)

Aurora Control System

Aurora 'Base' Control



NOTE: Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.

Control Features

Software ABC Standard Version 4.0

Single or Dual Capacity Compressors

Either single or dual capacity compressors can be operated.

Variable Speed ECM Blower Motor Option

A Variable Speed ECM blower motor can be driven directly using the onboard PWM output. Four blower speeds are available based upon the G, Y1, Y2, and W input signals to the board. The blower speeds can be changed either by the ECM manual configurations mode method or by using the Aurora AID Tool directly. All four blower speeds can be set to the same speed if desired.

Other Control Features

- Random start at power up
- Anti-short cycle protection
- High and low pressure cutouts
- Loss of charge
- Water coil freeze detection
- Air coil freeze detection
- Over/under voltage protection
- Condensate overflow sensor
- Load shed
- Dehumidification (where applicable)
- Emergency shutdown
- Hot gas reheat operation (where applicable)
- Diagnostic LED
- Test mode push button switch
- Two auxiliary electric heat outputs
- Alarm output
- Accessory output with N.O. and N.C.
- Modbus communication (master)
- Modbus communication (slave)

Field Selectable Options via Hardware

DIP Switch (SW1) – Test/Configuration Button (See SW1 Operation Table)

Test Mode

The control is placed in the test mode by holding the push button switch SW1 for 2 - 5 seconds. In test mode most of the control timings will be shortened by a factor of sixteen (16). LED3 (green) will flash at 1 second on and 1 second off. Additionally, when entering test mode LED1 (red) will flash the last lockout one time. Test mode will automatically time out after 30 minutes. Test mode can be exited by pressing and holding the SW1 button for 2 to 5 seconds or by cycling the power. **NOTE:** Test mode will automatically be exited after 30 minutes.

Variable Speed ECM Configuration Mode

The control is placed in the ECM configuration mode by holding the pushbutton switch SW1 for 5 to 10 seconds, the high, low, and "G" ECM speeds can be selected by following the LED display lights. LED2 (yellow) will fast flash when entering the ECM configuration. When setting "G" speed LED3 (green) will be continuously lit, for low speed LED1 (red) will be continuously lit, and for high speed both LED3 (green) and LED1 (red) will be continuously lit. During the ECM configuration mode LED2 (yellow) will flash each of the 12 possible blower speeds 3 times. When the desired speed is flashed press SW1, LED2 will fast flash until SW1 is released. "G" speed has now been selected. Next select low speed, and high speed blower selections following the same process above. After third selection has been made, the control will exit the ECM configuration mode. Aux fan speed will remain at default or current setting and requires the AID Tool for adjustment.

Reset Configuration Mode

The control is placed in reset configuration mode by holding the push button switch SW1 for 50 to 60 seconds. This will reset all configuration settings and the EEPROM back to the factory default settings. LED3 (green) will turn off when entering reset configuration mode. Once LED3 (green) turns off, release SW1 and the control will reset.

DIP Switch (SW2)

SW2-1 FP1 Selection – Low water coil temperature limit setting for freeze detection. On = 30°F; Off = 15°F.

SW2-2 FP2 Selection – On = 30°F; Off = N/A

SW2-3 RV – O/B - thermostat type. Heat pump thermostats with "O" output in cooling or "B" output in Heating can be selected. On = O; Off = B.

SW2-4 and 2-5 Access Relay Operation (P2)

Access Relay Operation	SW2-4	SW2-5
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON

Aurora Control System

Cycle with Blower - The accessory relay will cycle with the blower output.

Cycle with Compressor - The accessory relay will cycle with the compressor output.

Water Valve Slow Opening - The accessory relay will cycle and delay both the blower and compressor output for 90 seconds.

SW2-6 CC Operation – selection of single or dual capacity compressor. On = Single Stage; Off = Dual Capacity
SW2-7 Lockout and Alarm Outputs (P2) – selection of a continuous or pulsed output for both the LO and ALM Outputs. On = Continuous; Off = Pulsed
SW2-8 *Future Use*

Alarm Jumper Clip Selection

From the factory, ALM is connected to 24 VAC via JW2. By cutting JW2, ALM becomes a dry contact connected to ALG.

Variable Speed ECM Blower Speeds

The blower speeds can be changed either by using the ECM manual configurations mode method or by using the Aurora AID Tool directly (see Instruction Guide: Aurora Interface and Diagnostics (AID) Tool topic).

Field Selectable Options via Software

(Selectable via the Aurora AID Tool)

Variable Speed ECM Blower Speeds

An ECM blower motor can be driven directly using the onboard PWM output. Four blower speeds are available, based upon the "G", Y1 (low), Y2 (high), and Aux input signals to the board. The blower speeds can be changed either by the ECM manual configurations mode method (see ECM Configuration Mode topic) or by using the Aurora AID Tool directly. All four blower speeds can be set to the same speed if desired. Aux blower speed will remain at default or current setting and requires the AID Tool for adjustment.

Safety Features

The following safety features are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

Fuse – a 3 amp automotive type plug-in fuse provides protection against short circuit or overload conditions.

Anti-Short Cycle Protection – 4 minute anti-short cycle protection for the compressor.

Random Start – 5 to 80 second random start upon power up.

Fault Retry – in the fault condition, the control will stage off the outputs and then "try again" to satisfy the thermostat Y input call. Once the thermostat input calls are satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat Y input call, then the control will go to Lockout mode.

Lockout – when locked out, the blower will operate continuously in "G" speed, and PSC blower motor output will remain on. The Alarm output (ALM) and Lockout output (L) will be turned on. The fault type identification display LED1 (Red) shall flash the fault code. To reset lockout conditions with SW2-8 On, thermostat inputs "Y1", "Y2", and "W" must be removed for at least 3 seconds. To reset lockout conditions with SW2-8 Off, thermostat inputs "Y1", "Y2", "W", and "DH" must be removed for at least 3 seconds. Lockout may also be reset by turning power off for at least 30 seconds or by enabling the emergency shutdown input for at least 3 seconds.

Lockout With Emergency Heat - if the control is locked out in the heating mode, and a Y2 or W input is received, the control will operate in the emergency heat mode while the compressor is locked out. The first emergency heat output will be energized 10 seconds after the W input is received, and the blower will shift to high speed. If the control remains locked out, and the W input is present, additional stage of emergency heat will stage on after 2 minutes. When the W input is removed, all of the emergency heat outputs will turn off, and the ECM blower will shift to "G" speed and PSC blower motor output will remain on.

High Pressure – fault is recognized when the Normally Closed High Pressure Switch, P4-9/10 opens, no matter how momentarily. The High Pressure Switch is electrically in series with the Compressor Contactor and serves as a hard-wired limit switch if an overpressure condition should occur.

Low Pressure - fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is continuously open for 30 seconds. Closure of the LPS any time during the 30 second recognition time restarts the 30 second continuous open requirement. A continuously open LPS shall not be recognized during the 2 minute startup bypass time.

Loss of Charge – fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is open prior to the compressor starting.

Condensate Overflow - fault is recognized when the impedance between this line and 24 VAC common or chassis ground drops below 100K ohms for 30 seconds continuously.

Freeze Detection (Coax) - set points shall be either 30°F or 15°F. When the thermistor temperature drops below the selected set point, the control shall begin counting down the 30 seconds delay. If the thermistor value rises above the selected set point, then the count should reset. The resistance value must remain below the selected set point for the entire length of the appropriate delay to be recognized as a fault. This fault will be ignored for the initial 2 minutes of the compressor run time.

Freeze Detection (Air Coil) - uses the FP2 input to protect against ice formation on the air coil. The FP2 input will operate exactly like FP1 except that the set point is 30 degrees and is not field adjustable.

Aurora Control System

Over/Under Voltage Shutdown - An over/under voltage condition exists when the control voltage is outside the range of 18 VAC to 30 VAC. If the over/under voltage shutdown lasts for 15 minutes, the lockout and alarm relay will be energized. Over/under voltage shutdown is self-resetting in that if the voltage comes back within range of 18 VAC to 30 VAC for at least 0.5 seconds, then normal operation is restored.

Operation Description

Power Up - The unit will not operate until all the inputs and safety controls are checked for normal conditions. The unit has a 5 to 80 second random start delay at power up. Then the compressor has a 4 minute anti-short cycle delay after the random start delay.

Standby In standby mode, Y1, Y2, W, DH, and G are not active. Input O may be active. The blower and compressor will be off.

Heating Operation

Heating, 1st Stage (Y1) - The blower is started on "G" speed immediately and the compressor is energized 10 seconds after the Y1 input is received. The ECM blower motor is switched to low speed 15 seconds after the Y1 input.

Heating, 2nd Stage (Y1, Y2) - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The ECM blower will shift to high speed 15 seconds after the Y2 input is received.

Heating, 3rd Stage (Y1, Y2, W) - The hot water pump is de-energized and the first stage of electric heat is energized 10 seconds after the W command is received. If the demand continues the second stage of electric heat will be energized after 5 minutes.

Emergency Heat (W) - The blower will be started on "G" speed, 10 seconds later the first stage of electric heat will be turned on. 5 seconds after the first stage of electric heat is energized the blower will shift to Aux speed. If the emergency heat demand is not satisfied after 2 minutes the second electric heat stage will be energized.

Blower (G) - The blower will start immediately upon receiving a thermostat G command. If there are no other commands from the thermostat the ECM will run on "G" speed until the G command is removed. Regardless of blower input (G) from the thermostat, the blower will remain on for 30 seconds at the end of each heating cycle.

Cooling Operation

In all cooling operations, the reversing valve directly tracks the O input. Thus, anytime the O input is present, the reversing valve will be energized.

Cooling, 1st Stage (Y1, O) - The blower is started on "G" speed immediately and the compressor is energized 10 seconds after the Y1 input is received. The ECM blower motor is switched to low speed 15 seconds after the Y1 input.

Cooling, 2nd Stage (Y1, Y2, O) - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The ECM blower will shift to high speed 15 seconds after the Y2 input is received.

Blower (G) - The blower will start immediately upon receiving a thermostat G command. If there are no other commands from the thermostat the ECM will run on "G" speed until the G command is removed. Regardless of blower input (G) from the thermostat, the blower will remain on for 30 seconds at the end of each heating, cooling, and emergency heat cycle.

Dehumidification (Y1, O, DH or Y1, Y2, O, DH) - When a DH command is received from the thermostat during a compressor call for cooling the ECM blower speed will be reduced by 15% to increase dehumidification.

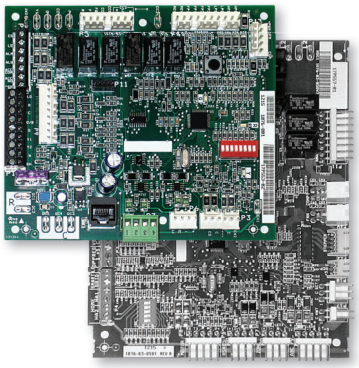
Emergency Shutdown - Four (4) seconds after a valid ES input, P2-7 is present, all control outputs will be turned off and remain off until the emergency shutdown input is no longer present. The first time that the compressor is started after the control exits the emergency shutdown mode, there will be an anti-short cycle delay followed by a random start delay. Input must be tied to common to activate.

Continuous Blower Operation - The blower output will be energized any time the control has a G input present, unless the control has an emergency shutdown input present. The blower output will be turned off when G input is removed.

Load Shed - The LS input disables all outputs with the exception of the blower output. When the LS input has been cleared, the anti-short cycle timer and random start timer will be initiated. Input must be tied to common to activate.

Aurora Control System

Aurora 'Advanced' Control Features



The Aurora 'Advanced' Control system expands on the capability of the Aurora 'Base' Control (ABC) by adding the Aurora Expansion Board (AXB). All of the preceding features of the Aurora 'Base' Control are included. The following control description is of the additional features and capability of the Aurora advanced control.

It is highly recommended the installing/servicing contractor obtain an Aurora Interface and Diagnostic Tool (AID) and specialized training before attempting to install or service an Aurora 'Advanced' control system.

The additional AXB features include the following:

AXB DIP Switch

DIP 1 - ID: This is the AXB ModBus ID and should always read On.

DIP 2 & 3 - Future Use

DIP 4 & 5 - Accessory Relay2: A second, DIP configurable, accessory relay is provided that can be cycled with the compressor 1 or 2 , blower, or the Dehumidifier (DH) input. This is to complement the Accessory 1 Relay on the ABC board.

Position	DIP 4	DIP 5	Description
1	ON	ON	Cycles with Fan or ECM (or G)
2	OFF	ON	Cycles with CC1 first stage of compressor or compressor spd 1-6
3	ON	OFF	Cycles with CC2 second stage of compressor or compressor spd 7-12
4	OFF	OFF	Cycles with DH input from ABC board

Advanced Hot Water Generator Control (Domestic Hot Water Option)

The Advanced features an AID Tool selectable temperature limit and microprocessor control of the Domestic Hot Water process. This will maximize hot water generation and prevent undesirable energy use. An alert will occur when the hot water input temperature is at or above setpoint (100°F - 140°F) for 30 continuous seconds (130°F is the default setting). This alert will appear as an E15 on the AID Tool and the hot water pump de-energizes. Hot water pump operations resume on the next compressor cycle or after 15 minutes of continuous compressor operation during the current thermostat demand cycle. Since compressor hot gas temperature is dependent on loop temperature in cooling mode, loop temperatures may be too low to allow proper heating of water. The control will monitor water and refrigerant temperatures to determine if conditions are satisfactory for heating water. LED1 (red LED) will flash code 15 when the DHW limit is reached and when conditions are not favorable for water heating. Error code 15 will also be displayed on the AID Tool in the fault screen. This flash code is a noncritical alert and does not necessarily indicate a problem.

Compressor Monitoring

The AXB includes two current transducers to monitor the compressor current and starting characteristics. Open circuits or welded contactor faults will be detected. A fault will produce an E10 code.

IntelliZone2 Zoning Compatibility (Optional IntelliZone2 Communicating Zoning)

A dedicated input to connect and communicate with the IntelliZone2 (IZ2) zoning system is provided on P7 on the AXB. The is a dedicated communication port using a proprietary ModBus protocol. An AXB is required. Consult the IntelliZone2 literature for more information.

AWL – Aurora Weblink (optional accessory)

AWL is an add-on WiFi router that connects to the ABC and offers many features:

- Remote access to thermostat settings, schedules, etc. with your smartphone, tablet or laptop
- Receive Lockout/Fault info via text or e-mail
- View heat pump energy usage from the Internet for the day, week, month, year or real-time
- Internet AID Tool capability allows remote troubleshooting for the technician
- Remote AID Tool capability at the heat pump with smartphone, tablet or laptop for the technician
- Allows data acquisition of the heat pump through the Internet, see graphs of performance and chart historical data for the technician
- Stores historical data on SD card

Variable Speed Pump

This input and output are provided to drive and monitor a variable speed pump. The VS pump output is a PWM signal to drive the variable speed pump. The minimum and maximum level are set using the AID Tool. 75% and 100% are the default settings respectively. The VS data input allows a separate PWM signal to return from the pump giving fault and performance information. Fault received from the variable speed pump will be displayed as E16.

Aurora Control System

Aurora 'Base' Control LED Displays

These three LEDs display the status, configuration, and fault codes for the control. These can also be read in plain English via the Aurora AID Tool.

Status LED (LED3, Green)

Description of Operation	Fault LED, Green
Normal Mode	ON
Control is Non-functional	OFF
Test Mode	Slow Flash
Lockout Active	Fast Flash
Dehumidification Mode	Flash Code 2
(Future Use)	Flash Code 3
(Future Use)	Flash Code 4
Load Shed	Flash Code 5
ESD	Flash Code 6
(Future Use)	Flash Code 7

Configuration LED (LED2, Yellow)

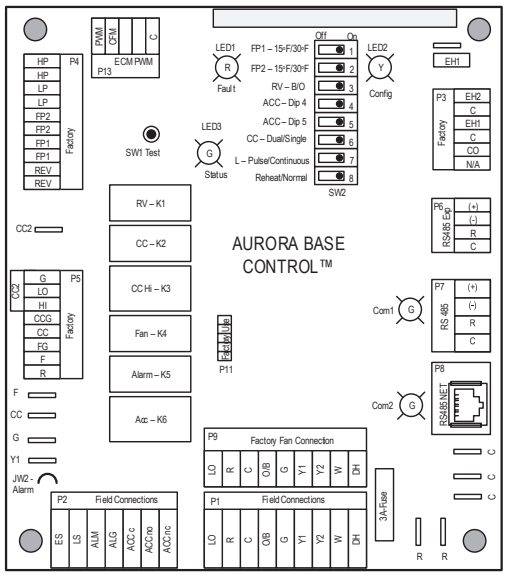
Description of Operation	Configuration LED, Yellow
No Software Overwritten	Flashing ECM Setting
DIP Switch was Overwritten	Slow Flash
ECM Configuration Mode	Fast Flash

Fault LED (LED1, Red)

Red Fault LED		LED Flash Code*	Lockout	Reset/Remove
ABC Basic Faults	Normal - No Faults	OFF	–	
	Fault - Input	1	No	Auto
	Fault - High Pressure	2	Yes	Hard or Soft
	Fault - Low Pressure	3	Yes	Hard or Soft
	Fault - Freeze Detection FP2	4	Yes	Hard or Soft
	Fault - Freeze Detection FP1	5	Yes	Hard or Soft
	Fault - Condensate Overflow	7	Yes	Hard or Soft
	Fault - Over/Under Voltage	8	No	Auto
	Fault - FP1 Sensor Error	11	Yes	Hard or Soft
	Fault - CritComErr	19	NO	Auto

NOTE: All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50, etc. are skipped.

ABC Control Board Layout



ASB Sensor Board

Refrigerant Leak Detection

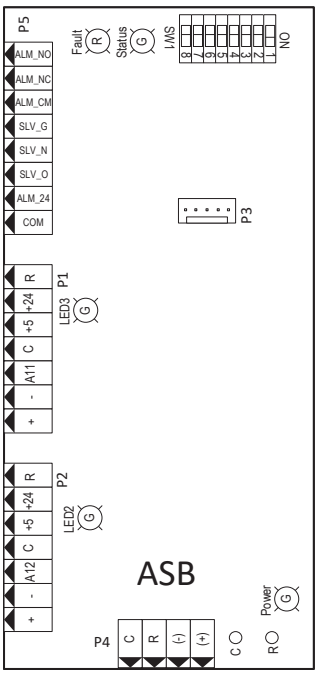
The Aurora control system uses the ASB control board to monitor the refrigerant sensor and determine when a fault condition requiring mitigation has been recognized and is active.

The ASB control will provide the indicator for an active refrigerant leak condition requiring mitigation in addition to the currently measured refrigerant level in ppm for each sensor connected to the ASB.

Refrigerant Leak Mitigation

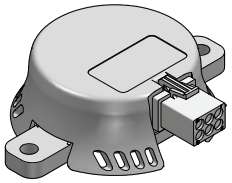
The refrigeration sensor will detect a leak if the LFL (Lower Flammability Limit) exceeds 13%. The ASB board will communicate the leak detection to the ABC control board. The ABC will deactivate the compressor, auxiliary heat and pump outputs. The system's blower will come on, and the system will continue to operate in this state until the ABC is no longer reporting a fault condition.

ASB Control Board



ASB Green Status LED	
OFF	Power Off
Slow Flash	Normal Operation
Fast Flash	ABC Loss Communication
ASB Red Fault LED	
OFF	Power Off
Slow Flash	Alarm
Fast Flash	Sensor Loss Communication

RDS Refrigeration Detection Sensor



RDS Green Status LED	
Solid	Power Up / Self Test
Blinking	Normal Operation
RDS Red Fault LED	
Solid	Alarm State
Blinking	Sensor Fault

Aurora Control System

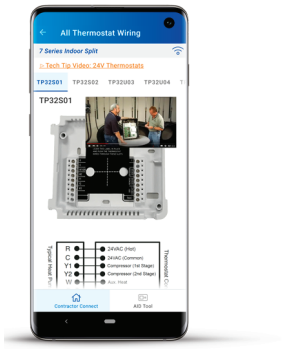
Aurora Interface and Diagnostics (AID) Tool

The Aurora Interface and Diagnostics (AID) Tool is a device that is a member of the Aurora network. The AID Tool is used to troubleshoot equipment which uses the Aurora control via Modbus RTU communication. The AID Tool provides diagnostics, fault management, variable speed ECM setup, and system configuration capabilities to the Aurora family of controls. An AID Tool is recommended, although not required, for ECM airflow settings. The AID Tool simply plugs into the exterior of the cabinet in the AID Tool port.

Aurora Contractor Connect and Symphony Contractor Connect (W5 Models Only)

The Symphony Contractor Connect (SCC) brings ground source heat pump data and troubleshooting to your fingertips. Symphony Contractor Connect with the use of the Aurora Contractor Connect (ACC) replaces the current AID Tool. This app provides an enhanced and more efficient experience for the service technician in assessing system performance and component troubleshooting. REQUIRES dealer login credentials.

- AID Tool
- Technical Literature lookup
- Troubleshooting videos
- Step by Step AWL Setup and Configuration to Home Router
- Methodical approach to assist in diagnostics
- Perform routine installation chart reading and calculations
- Electronic capture of Start-Up Documentation
- Active Charge Assist and Charge Calculator for split systems



Modulating Water Valve

This output is provided to drive a modulating water valve. Through advanced design the 0-10VDC valve can be driven directly from the VS pump output. The minimum and maximum level are set in the same way as the VS pump using the AID Tool. 75% and 100% are the default settings respectively.

Loop Pump Linking

This input and output are provided so that two units can be linked together with a common flow center. When either unit has a call for loop pump, both unit's loop pump relays and variable speed pumps are energized. The flow center then can simply be wired to either unit. The output from one unit should be routed to the input of the other. If daisy chained up to 16 heat pumps can be wired and linked together in this fashion.

Advanced Communication Ports

Communication ports P6 and P8 will provide future expansion via dedicated protocols. These are for future use.

Smart Grid-On Peak (SG) Input

The 'On Peak' input was designed to allow utilities to utilize simple radio controlled switches to control the On Electric Peak behavior of the 5 and 7 Series Geothermal Heat Pumps. With a closed contact signal, this input will limit the operation and thus the power consumption of the unit by one of the below selections. The AID Tool will allow configuration of this input for the action of:

- No Action
- Disable compressor operation until removed
- Go to On Peak thermostat settings until removed [Requires Com T-Stat] (Future Release)
- Compressor limited to 50% or low cap until removed [dual capacity or variable speed only] (Future Release)
- Disable compressor operation for 1/2 hr (can be removed immediately) (Future Release)

Then Flash Code 7 on the Green LED for the 'On Peak' mode. And On Peak will display on communicating thermostats.

Home Automation 1 and 2 Inputs

The Home automation inputs are simple closed contact inputs that will trigger an AID Tool and thermostat alert for the homeowner. These would require optional sensors and or equipment for connection to the AXB board. With two inputs two different sensors can be selected. The selected text will then be displayed on the AID Tool and communicating thermostats. These events will NOT alter functionality or operation of the heat pump/accessories and is for homeowner/service notification only.

Aurora Control System

Home Automation 1 - E23 HA1
With a closed dry contact signal, this input will cause an alarm and Alert Code 23 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of this input between the following selections:

- No Action
- Home Automation Fault [no lockout info only] Output from home automation system
- Security Alarm [no lockout info only] Output from home security
- Sump Alarm Fault [no lockout info only] - Switch output from sump sensor
- Smoke/CO Alarm Fault [no lockout info only] Switch output from Smoke/CO sensor
- Dirty Filter Alarm [no lockout info only] - Output from dirty filter sensor

Home Automation 2 – E24 HA2
With a closed dry contact signal, this input will cause an alarm and Alert Code 24 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of this input between the following selections:

- No Action
- Home Automation Fault [no lockout info only] Output from home automation system
- Security Alarm [no lockout info only] Output from home security
- Sump Alarm Fault [no lockout info only] - Switch output from sump sensor
- Smoke/CO Alarm Fault [no lockout info only] Switch output from Smoke/CO sensor
- Dirty Filter Alarm [no lockout info only] - Output from dirty filter sensor

Monitoring Sensor Kits

Energy Monitoring (Standard Sensor Kit on 'Advanced' Premium Controls)

The Energy Monitoring Kit includes two current transducers (blower and electric heat) added to the existing two compressor sensors so that the complete power usage of the heat pump can be measured. The AID Tool provides configuration detail for the type of blower motor, power adjustment and a line voltage calibration procedure to improve the accuracy, and a power adjustment setting that allows the compressor power to be adjusted to match the unit's line voltage using the provided tables. This information can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U03A/04A will display instantaneous energy use while the color touchscreen TPCC32U03* will in addition display a 13 month history in graph form. Refer to Unit Start Up Energy Monitoring for configuration details.

Refrigerant Monitoring (Standard Sensor Kit Premium Controls)

The optional Refrigerant Monitoring Kit includes two pressure transducers, and three temperature sensors, heating liquid line, suction temperature and existing cooling liquid line (FP1).

Dual Capacity Power Adjustment

Model	Unit Capacity	Voltage		
		208	230	250
018	Full Load	0.98	0.99	0.97
018	Part Load	0.98	0.99	0.94
024	Full Load	0.99	0.99	0.96
024	Part Load	0.99	0.99	0.93
030	Full Load	0.97	0.97	0.94
030	Part Load	0.97	0.94	0.88
036	Full Load	0.99	0.97	0.91
036	Part Load	0.99	0.94	0.83
042	Full Load	0.95	0.93	0.88
042	Part Load	0.92	0.86	0.78
048	Full Load	0.94	0.91	0.85
048	Part Load	0.91	0.84	0.75
060	Full Load	0.95	0.91	0.79
060	Part Load	0.92	0.83	0.71
072	Full Load	0.94	0.86	0.73
072	Part Load	0.92	0.81	0.65

5/15/24

These sensors allow the measurement of discharge and suction pressures, suction and liquid line temperatures as well as superheat and subcooling. This information will only be displayed on the AID Tool.

Performance Monitoring (Standard Sensor Kit Premium Controls)

The optional Performance Monitoring Kit includes three temperature sensors, entering and leaving water, leaving air temperature and a water flow rate sensor. With this kit heat of extraction and rejection will be calculated. This requires configuration using the AID Tool for selection of water or antifreeze.

Special Modes and Applications

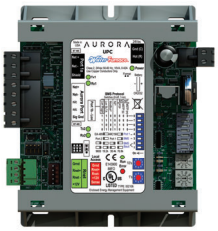
Communicating Digital Thermostats

The Aurora controls system also features either mono-chromatic or color touch screen graphic display thermostats for user interface. These displays not only feature easy to use graphical interface but display alerts and faults in plain English. Many of the features discussed here may not be applicable without these thermostats.

Dehumidification – Passive

In passive dehumidification mode, the airflow is reduced by 15% from the heating airflow setting. If cooling airflow is set to +5, -5 or -10% of heating airflow it will automatically be set to -15% of heating airflow whenever the dehumidification call is present in the communicating stat or from the thermostat input DH. If the airflow for cooling is already set to -15% no airflow change will be noticed from normal cooling. Dehumidification mode will be shown on the ABC and the communicating thermostats.

Aurora Control System

Aurora Control w/UPC BACnet  ***W5 Models Only**	The Aurora Unitary Protocol Converter (UPC) is an integrated solution and communicates directly with the Aurora Heat Pump Controls and allows access/control of a variety of internal Aurora Heat pump operations such as sensors, relay operation, faults and other information. In turn, the UPC then converts internal Aurora Modbus protocol to BACnet MS/TP protocol and communicates to the HAS system. This provides the great benefit of complete control integration and a myriad of information available to the HAS from the heat pump control. Plus it also allows individual unit configuration such as ECM fan speeds or freeze protection setting directly over the HAS without the need for access to the actual heat pump.	The Aurora UPC is implemented with the Aurora Base Controller (ABC) heat pump control into our latest water source heat pumps. All internal Aurora points are accessible to the UPC via firmware providing an integrated solution. All zone temperatures and zone sensors are connected to the UPC on an RNet bus, simplifying hook up at the unit. RNet sensors can include a combination of zone temperature and humidity, CO2, and VOC sensors. The UPC includes built-in support for a custom configurable keypad/display unit.	Optional Equipment Touch Display	BACnet MS/TP

UPC Sensors & Thermostats	Description	Aurora 'Base'	Aurora 'Base'	Aurora 'Advanced'
ZS Standard 	Local access port /No user control	Optional	Optional	Optional
ZS Plus 	Local access port/Slide potentiometer to make the zone warmer or cooler /Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Green LED to Indicate occupied state.	Optional	Optional	Optional
ZS Pro 	Local access port/LED display/Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Arrow UP and DOWN buttons to change any editable property, such as the setpoint temperature/ibutton to cycle through information defined in the control program/ Green LED to Indicate occupied state.	Optional	Optional	Optional
ZS Pro-F 	Local access port/LED display/Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Arrow UP and DOWN buttons to change any editable property, such as the setpoint temperature/ibutton to cycle through information defined in the control program/ Green LED to Indicate occupied state/Mode button to turn on heating, cooling, or fan only, or to set auto control/ Fan button to adjust fan speed/ F/C button to set temperature to Fahrenheit of Celsius	Optional	Optional	Optional

NOTE: A ZS type sensor/thermostat is necessary for compatibility with UPC.

Aurora UPC

An optional Aurora UPC for DDC applications communicates directly with the entire Aurora system and provides DDC protocol of BACnet MS/TP for connection to the HAS providing a wide variety of points covering configurations, sensors, airflow and freeze protection. For more information on the Aurora UPC, please consult the Aurora UPC Application Guide for Variable Speed Applications.

NOTE: The UPC is not compatible with IntelliZone2 or Symphony.

Aurora Touch Interface

Utilizing the service technicians personal Android tablet (Android 4.0 or higher) along with Equipment Touch App (purchased from the Play Store) and our Aurora Touch Cable (part number ATCK01), a technician will have the ability to access the UPC to configure and diagnose equipment at the unit or from any room sensor. The technician will have full access to equipment status, parameter values, temperature, and humidity sensing as well as access to alarm history. The Equipment Touch App is easy to use and provides important insight into the system so it can operate as efficiently as possible.

Aurora Control System

Aurora 'Advanced' Control LED Displays

These three LEDs display the status, configuration, and fault codes for the control. These can also be read in plain English via the Aurora AID Tool.

Status LED (LED3, Green)

Description of Operation	Fault LED, Green
Normal Mode	ON
Control is Non-functional	OFF
Test Mode	Slow Flash
Lockout Active	Fast Flash
Dehumidification Mode	Flash Code 2
Load Shed	Flash Code 5
Emergency Shutdown	Flash Code 6
On Peak Mode	Flash Code 7
(Future Use)	Flash Code 8
(Future Use)	Flach Code 9

Configuration LED (LED2, Yellow)

Description of Operation	Configuration LED, Yellow
No Software Overwritten	ECM Setting
DIP Switch Overwritten	Slow Flash
ECM Configuration Mode	Fast Flash
Reset Configuration Mode	OFF

Fault LED (LED1, Red)

	Red Fault LED	LED Flash Code*	Lockout	Reset/ Remove	Fault Condition Summary
ABC & AXB Basic Faults	Normal - No Faults	Off			
	Fault-Input	1	No	Auto	Tstat input error. Autoreset upon condition removal.
	Fault-High Pressure	2	Yes	Hard or Soft	HP switch has tripped (>600 psi)
	Fault-Low Pressure	3	Yes	Hard or Soft	Low Pressure Switch has tripped (<40 psi for 30 continous sec.)
	Fault-Freeze Detection FP2	4	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)
	Fault-Freeze Detection FP1	5	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)
	Fault-Loss of Charge	6	Yes	Hard or Soft	Low Pressure Switch open prior to compressor start (UPC Only)
	Fault-Condensate Overflow	7	Yes	Hard or Soft	Condensate switch has shown continuity for 30 continuous sec.
	Fault-Over/Under Voltage	8	No**	Auto	Instantaneous Voltage is out of range. **Controls shut down until resolved.
	Fault-Compressor Monitor	10	Yes	Hard or Soft	Open Crkt, Run, Start or welded cont
	Fault-FP1 & 2 Snsr Error	11	Yes	Hard or Soft	If FP1 or 2 Sensor Err
	Non-CriticAXBSnsrErr	13	No	Auto	Any Other Sensor Err
	CriticAXBSnsrErr	14	Yes	Hard or Soft	Sensor Err for EEV or HW
	Alarm-HotWtr	15	No	Auto	HW over limit or logic lockout. HW pump deactivated.
	Fault-VarSpdPump	16	No	Auto	Alert is read from PWM feedback.
	Non-CritComErr	18	No	Auto	Any non-critical com error
	Fault-CritComErr	19	No	Auto	Any critical com error. Auto reset upon condition removal
	Alarm - Low Loop Pressure	21	No	Auto	Loop pressure is below 3 psi for more than 3 minutes
	Alarm - Home Automation 1	23	No	Auto	Closed contact input is present on Dig 2 input - Text is configurable
	Alarm - Home Automation 2	24	No	Auto	Closed contact input is present on Dig 3 input - Text is configurable
	Fault - AXB EEV Error	25	Yes	Auto	AXB EEV Error
Ind/Pkg EEV2	Fault-SucPrsSnr	52	Yes	Auto	Suction Pressure (P_o) is invalid (0 to 232 psi)
	Fault-LossofCharge	71	Yes	Hard or Soft	High superheat and high EEV opening % for a long time will trigger a loss of charge fault
	SafeMd-SucTmpSnr	72	No	Auto	Suction Temperature Sensor is invalid (-76 to 392 F)
	SafeMd-LATSensor	73	No	Auto	Leaving Air Temperature Sensor is invalid (-76 to 392 F)
	SafeMd-MaxOpPres	74	No	Auto	Suction pressure has exceeded that maximum operating level for 90 sec.
ASB	ASB Leak Detected	81	Yes	Auto	High refrigerant gas concentration detected by ASB and gas sensor.
	ASB Sensor Problem	82	Yes	Auto	Gas sensor has issued a fault, lost communication, internal error
	Invalid System Config	97	Yes	Auto	ABC has not been configured for Refrigerant type, disch pr sensor type, or suct press sens.

Note:

*All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50 etc. will be skipped!

Alert' is a noncritical sensor or function that has failed. Normal operation of the heat pump is maintained but service is desired at some point.

Aurora Control System

Aurora now expands the Fault/Alarms in to several groups. Faults are system critical faults to the heat pump and will cause a Lockout. Some are retried 3 times before locking out while others lockout out immediately. Consult the Fault Retries table before lockout for details. Alarms are designed solely to alert the customer and the dealer to alarms designed as an input only to the Aurora system. These alarms are not system critical. Errors are sensor/hardware errors that although may not be system critical, may need serviced for optimal features.
SafeMode - the system is still operational during safemode.

Summary Table of Faults, Alarm, and Errors

All lockouts and alarms are shown in the Status LED (LED1, Red) table with the associated codes visible on the thermostat, ABC Fault LED, and in text in the AID Tool.

Aurora Fault Codes (ABC-Red LED)

These fault codes generally will affect the operation of the heat pump and will cause a lockout.

E1, Fault Input - A Y1/Y2 style thermostat is providing a non-normal sequence of signals possibly caused by a bad thermostat wire or connection.

E2, High Pressure - Fault is recognized when the Normally Closed High Pressure Switch, P4-9/10 opens, no matter how momentarily. The High Pressure Switch is electrically in series with the Compressor Contactor and serves as a hardwired limit switch if an overpressure condition should occur.

E3, Low Pressure - Fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is continuously open for 30 seconds. Closure of the LPS any time during the 30 second recognition time restarts the 30 second continuous open requirement. A continuously open LPS shall not be recognized during the 2 minute startup bypass time.

E3, Loss of Charge - Fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is open prior to the compressor starting.

E4, Freeze Detection-Air Coil - Air Coil Freeze Detection will use the FP2 input to protect against ice formation on the air coil. The FP2 input will operate exactly like FP1 except that the set point is 30 degrees and is not field adjustable.

E5, Freeze Detection-Coax - Set points shall be either 30°F or 15°F. When the thermistor temperature drops below the selected set point, the control shall begin counting down the 30 seconds delay. If the thermistor value rises above the selected set point, then the count should reset. The resistance value must remain below the selected set point for the entire length of the appropriate delay to be recognized as a fault. This fault will be ignored for the initial 2 minutes of the compressor run time.

E7, Condensate Overflow - Fault is recognized when the impedance between this line and 24 VAC common or chassis ground drops below 100K ohms for 30 seconds continuously.

E8, Over/Under Voltage Shutdown - An over/under voltage condition exists when the control voltage is outside the range of 18 VAC to 30 VAC. If the over/under voltage shutdown lasts for 15 minutes, the lockout and alarm relay will be energized. Over/under voltage shutdown is self-resetting in that if the voltage comes back within range of 18 VAC to 30 VAC for at least 0.5 seconds, then normal operation is restored.

E10, Compressor Monitoring - Fault is recognized when the compressor has an open circuit, potential welded contactor.

E11, FP1 Sensor Error - Fault is recognized when the impedance between this line and 24 VAC common or chassis.

E14, Critical AXB Sensor Error - Fault is recognized when a sensor faults that is critical to heat pump operation. These sensors would include the HW Temperature limit sensor.

E15, Alarm Hot Water - Fault is recognized when the hot water temperature sensor is either over the configured limit or the Aurora has determined the current conditions should disengage the hot water generation capability.

E16, Variable Speed Pump - Fault is recognized when the variable speed pump returns a fault code from its PWM feedback signal.

E19, Critical Communication Error - A critical communication error has occurred with a board that previously had been configured but now is not available for communication.
Since this is critical to unit operation, the heat pump will be locked out with this fault displayed on the ABC board and the thermostat. The AID Tool should be used to view the configuration window and ascertain the status of all
appropriate board communication. The fault displayed will be removed when the problem has been resolved or the unit is soft or hard reset.

E52, Suction Pressure Invalid - The reading of the suction pressure transmitter is not within the specified sensor range of 0 to 16bar (0 to 232psi). Possible causes are faulty wiring or a defective transmitter.

E81, ASB Leak Detected - The gas sensor has detected a leak. The ABS will communicate the leak to the ABC control board. Compressor and auxiliary heat will be deactivated, and blower will come on.

Aurora Control System

E82, ASB Sensor Problem - The gas sensor has lost communication with the ASB board or has an internal error.

E97, Invalid System Configuration - ABC has not been configured for sensor or refrigeration type.

Aurora Error Codes

NOTE: The system is operating normally, but a sensor or communication issue is preventing full features of the system. Since these can be deemed non-critical to system operation, such as internet access boards etc., they may simply cause errors/alerts that signal the user to the situation but may not effect normal operation.

E13, Non Critical AXB Sensor Error - Fault is recognized when a sensor faults that is not critical to heat pump operation. These sensors would include the performance, energy monitoring and refrigeration sensors.

E18, Error Non-Critical Communication Error - A non-critical communication error has occurred such as communication to the internet access board. Since this is not critical to unit operation, the heat pump will continue operating normally with this error displayed on the ABC board and the thermostat. The AID Tool should be used to view the configuration window and ascertain the status of all appropriate board communication. The Error displayed will be removed when the problem has been resolved.

Aurora SafeMode Codes

NOTE: The system is still operational during safemode. It is possible for some situations to progress from Derating to SafeMode to finally locking out due to a fault.

E72, SafeMode EEV - Suction Temperature Invalid - The reading of the suction temperature sensor is not within the specified sensor range of -60 to +200°C (-76 to +392°F). The EEV will be positioned at 50%. Possible causes are faulty wiring or a defective sensor.

E73, SafeMode EEV – Leaving Air Temperature (LAT) Invalid - The reading of the leaving air temperature sensor is not within the specified sensor range of -60 to +200°C (-76 to +392°F). Normal operation will continue with an Error 73 display on the thermostat to notify the user of the issue. Possible causes are faulty wiring or a defective sensor. The Error displayed will be removed when the problem has been resolved.

E74, SafeMode EEV - Maximum Operating Pressure (MOP) - The reading of the suction pressure is above the recommended limit. If this condition persists more than 90 seconds, the Drive will revert to a Fault – Out of Envelope Code 35.

Aurora Alarm Codes

These alarms are planned to alert the homeowner and the service personnel but will NOT effect system operation and are for information only. These would be available on the thermostat, AID Tool and the internet access for remote monitoring capability.

E21, Loop Pressure Alarm - Fault is recognized when the loop pressure sensor is installed and the loop pressure falls below the setpoint.

E23 and E24, Home Automation 1 and 2 Inputs - The Home automation inputs are simple 24VAC inputs that will trigger an AID Tool and thermostat alert for the homeowner. These would require optional sensors and or equipment for connection to the AXB board. With two inputs, two different sensors can be selected. The selected text will then be displayed on the AID Tool and com thermostats. These events will NOT alter functionality or operation of the heat pump/accessories and is for homeowner/service notification only. With a closed dry contact signal, this input will cause an alarm E23 or E24 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of these two inputs independently between the following selections:

- *No Action*
- *Home Automation Fault [no lockout, info only]* - Output-from home automation system

Refrigerant Circuit Guideline

Symptom	Head Pressure	Suction Pressure	Compressor Amp Draw	Superheat	Subcooling	Air Temp. Differential	Water Temp. Differential
Under Charged System (Possible Leak)	Low	Low	Low	High	Low	Low	Low
Over Charged System	High	High	High	Normal	High	Normal/Low	Normal
Low Air Flow Heating	High	High	High	High/Normal	Low	High	Low
Low Air Flow Cooling	Low	Low	Low	Low/Normal	High	High	Low
Low Water Flow Heating	Low/Normal	Low/Normal	Low	Low	High	Low	High
Low Water Flow Cooling	High	High	High	High	Low	Low	High
High Air Flow Heating	Low	Low	Low	Low	High	Low	Low
High Air Flow Cooling	Low	High	Normal	High	Low	Low	Normal
High Water Flow Heating	Normal	Low	Normal	High	Normal	Normal	Low
High Water Flow Cooling	Low	Low	Low	Low	High	Normal	Low
Low Indoor Air Temperature Heating	Low	Low	Low	Normal	High	Normal	Normal/High
Low Indoor Air Temperature Cooling	Low	Low	Low	Normal/Low	High	Low	Low
High Indoor Air Temperature Heating	High	High	High	Normal/High	Normal/Low	Low	Normal
High Indoor Air Temperature Cooling	High	High	High	High	Low	Low	High
Restricted Expansion Device	High	Low	Normal/Low	High	High	Low	Low
Insufficient Compressor (Possible Bad Valves)	Low	High	Low	High	Normal/High	Low	Low
Scaled Coaxial Heat Exchanger Heating	Low	Low	Low	Normal/Low	High	Low	Low
Scaled Coaxial Heat Exchanger Cooling	High	High	High	Normal/Low	Low	Low	Low
Restricted Filter Drier	Check temperature difference (delta T) across filter drier.						

Electrical Information

General

Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable.

Unit Power Connection

Connect the incoming line voltage wires to L1 and L2 of the contactor as shown in Figure 13C for single-phase unit. Consult the Unit Electrical Data in this manual for correct fuse sizes.

Open lower front access panel. Remove ground fastener from bottom of control box (Figure 13B). Swing open control box (Figure 13A). Insert power wires through knockouts on lower left side of cabinet. Route wires through left side of control box and connect to contactor and ground (Figure 13C). Close control box and replace grounding fastener before unit start-up.

Accessory Relay

A set of “dry” contacts has been provided to control accessory devices, such as water solenoid valves on open loop installations, electronic air cleaners, humidifiers, etc. This relay contact should be used only with 24 volt signals and not line voltage power. The relay has both normally open and normally closed contacts and can operate with either the fan or the compressor. Use DIP switch SW2-4 and 5 to cycle the relay with blower, compressor, or control a slow opening water valve. The relay contacts are available on terminals #1 and #3 for normally closed, and #2 and #3 for normally open on P2.

A second configurable accessory relay is provided on the AXB board, if installed. When powering high VA draw components such as electronic air cleaners or V type open loop water valves, R should be taken ‘pre-fuse’ from the ‘R’ quick connect on the ABC board and not the ‘post-fuse’ ‘R’ terminal on the thermostat connection. If not, blown ABC fuses might result.

208 Volt Operation

All 208/230 units are factory wired for 230 volt operation. For 208 volt operation, the red and blue transformer wires must be switched on terminal strip PB2.

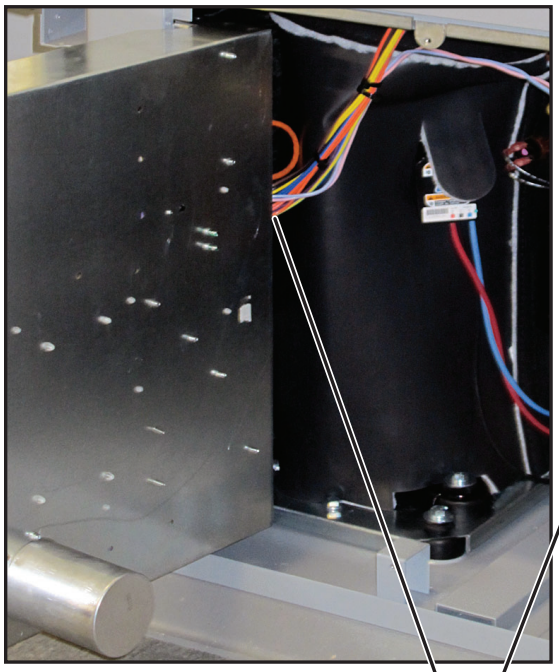
Pump Power Wiring

See Figure 14 for electrical connections from control box to pumps.

FC1/FC2 style flow centers with fixed speed pumps connect to PB1 in the control box. If using a variable speed pump it should be connected to L1 and L2 on the AXB.

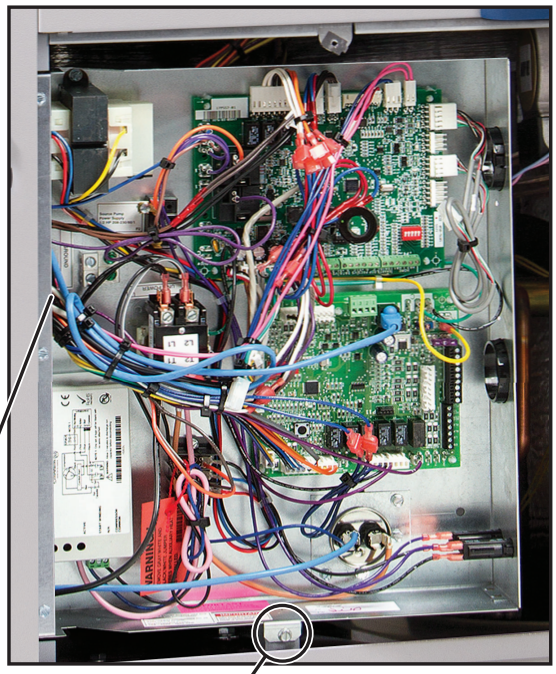
Electrical Information

Figure 13A:
Wire access (control box open)



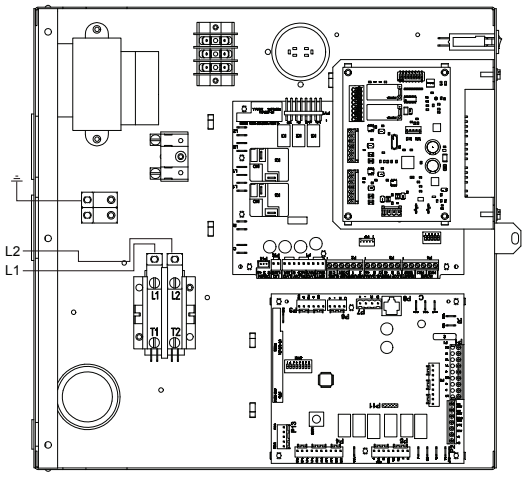
Wire Insert Location

Figure 13B:
Wire access (control box closed)

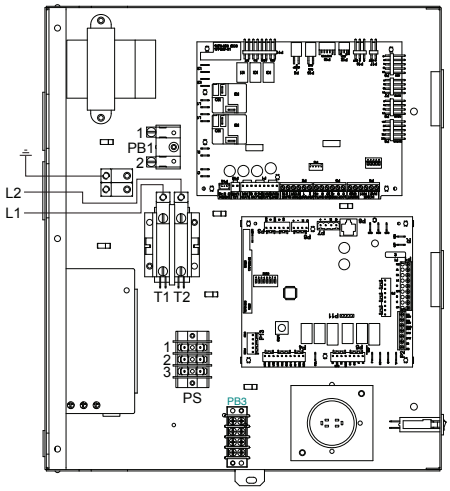


Ground Fastener must be installed for proper unit ground

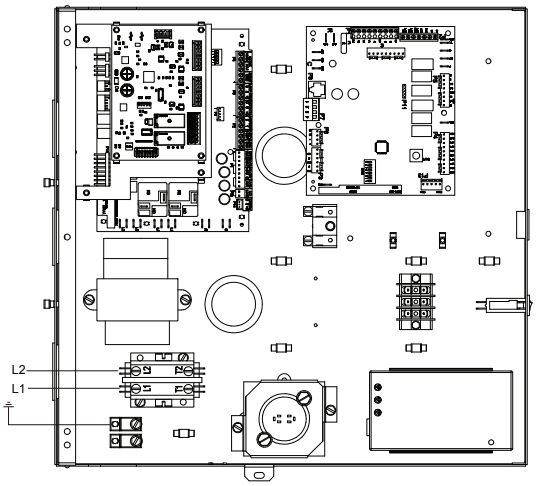
Figure 13C:
Line Voltage 208-230/60/1 control box



(018)



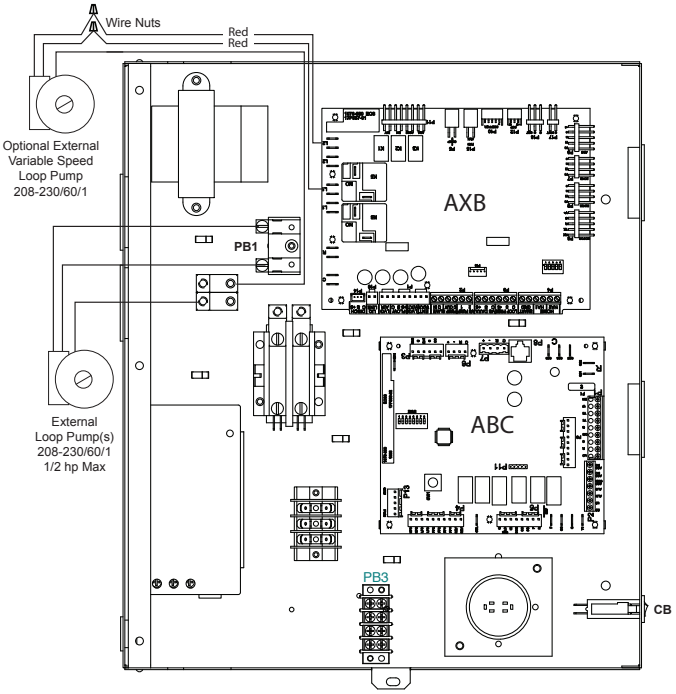
(024-030)



(036-072)

Electrical Information cont.

Figure 14: Pump Wiring 208-230/60/1



Electronic Thermostat Installation

Position the thermostat subbase against the wall so that it is level and the thermostat wires protrude through the middle of the subbase. Mark the position of the subbase mounting holes and drill holes with a 3/16-inch bit. Install supplied anchors and secure base to the wall. Thermostat wire must be 8-conductor (4 or 5 conductor for communicating thermostats), 20-AWG (minimum) wire. Strip the wires back 1/4-inch (longer strip lengths may cause shorts) and insert the thermostat wires into the connector as shown. Tighten the screws to ensure secure connections. The thermostat has the same type connectors, requiring the same wiring. See instructions enclosed in the thermostat for detailed installation and operation information. The W1 terminal on TPCM32U03A and TPCM32U04A communicating thermostats may be hard wired to provide aux/emergency heat in the event communication is lost between the thermostat and the ABC microprocessor.

NOTE: Aurora Base Control (ABC) DIP switch SW2-7 is required to be in the "OFF" position for the control to operate with FaultFlash or ComforTalk thermostats. SW2-7 in the "ON" position configures the control to operate with typical thermostats (continuous lockout signal). There must be a wire connecting Y2 on the Aurora controller to 2nd stage compressor on the thermostat for proper operation. SW2-7 DIP switch position is not relevant with communicating thermostats.

Figure 21: Thermostat Wiring (Y1 Style Signals)

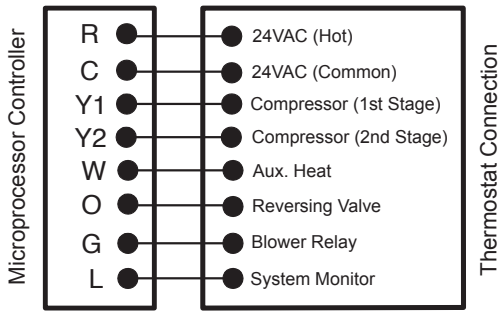
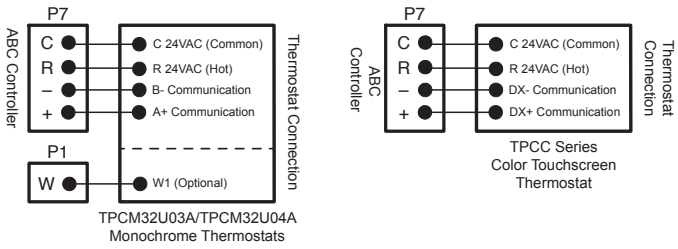


Figure 22: Thermostat Wiring (Communicating Style Signals)

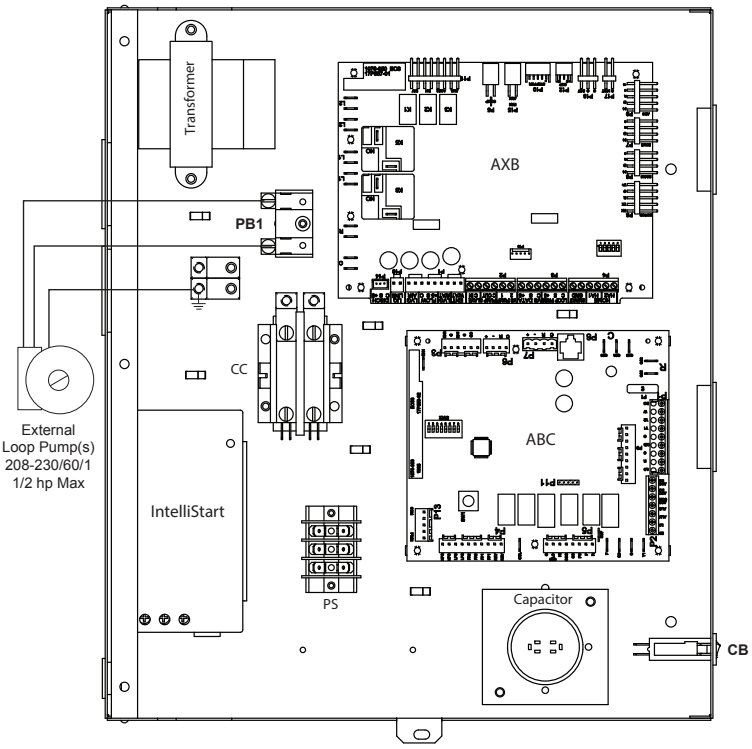


Electrical Information - Flow Centers

Fixed Speed Flow Center

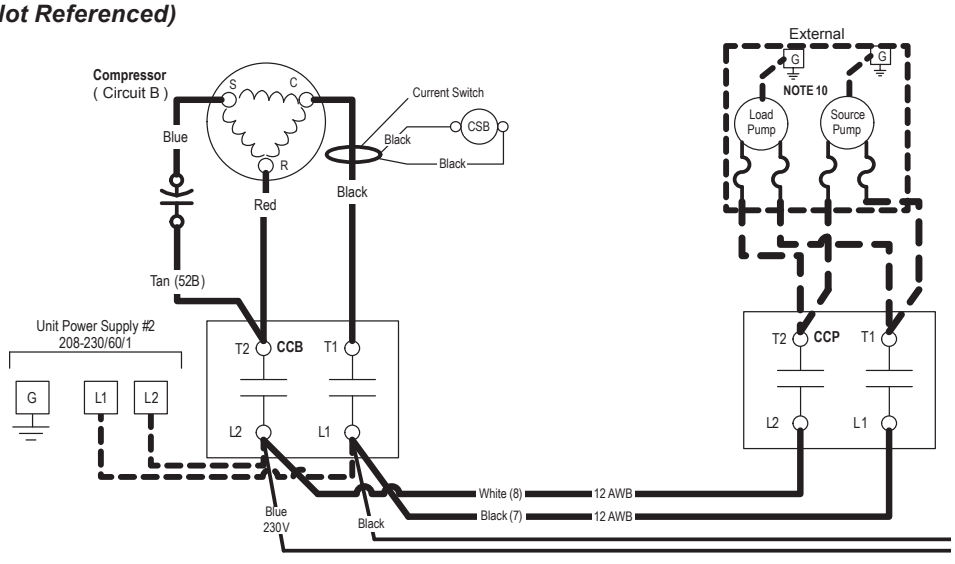
The pump(s) will be connected to the terminals on PB1 in the unit electrical box as shown in Figure 15. The pumps will automatically be cycled as required by the unit or by a signal from another unit sharing the flow center (See Figures 5 and 6). Pumps are protected by circuit breakers (CB) shown in Figure 15.

Figure 15: Single/Dual Cap Unit Wiring for Loop Pumps



NOTES: For closed loop systems with antifreeze protection, set SW2 DIP Switch #1 to the "Loop" position on units with the Aurora control.

Figure: FCM and FCL Flow Center Wiring (Not Referenced)



NOTES: FCM and FCL Flow Centers must be wired to a separate contactor (20 amp minimum). The HydroZone Accessory Control Box works best for this application.

Electrical Information - Flow Centers cont.

Variable Speed Flow Center

Single Pump Variable Speed Flow Center

If a variable speed single pump flow center is used, the flow center will come with two red and one green wires for the high voltage wiring. The variable speed pump MUST be powered at all times and therefore **MUST** be wired to the "L" side of electrical system or damage to the pump will occur (pump cannot be powered from "T" side of compressor contactor). Connect the red HIGH VOLTAGE wires to L1 and L2 on the AXB, connect the green GROUND wire to the ground lug, as shown in figure 17. The low voltage wiring (PMW) will turn the pump(s) ON and OFF. Follow all electrical and local codes for wiring.

The variable speed UPMXL 25-124 pump also requires a low voltage signal to operate properly, if the low voltage wires aren't connected or the signal isn't present the pump will run at 100%. Route the low voltage harness connected to the pump to the AXB screw terminals on P2 and P3 connectors per diagram 18.

Both the low and high voltage harnesses are labeled. The pump will be automatically cycled as required either by the unit or by a signal from another unit sharing the same flow center. Pumps are protected by circuit breakers as shown on the unit schematic.

Figure 17: Single VS Pump High Voltage Wiring

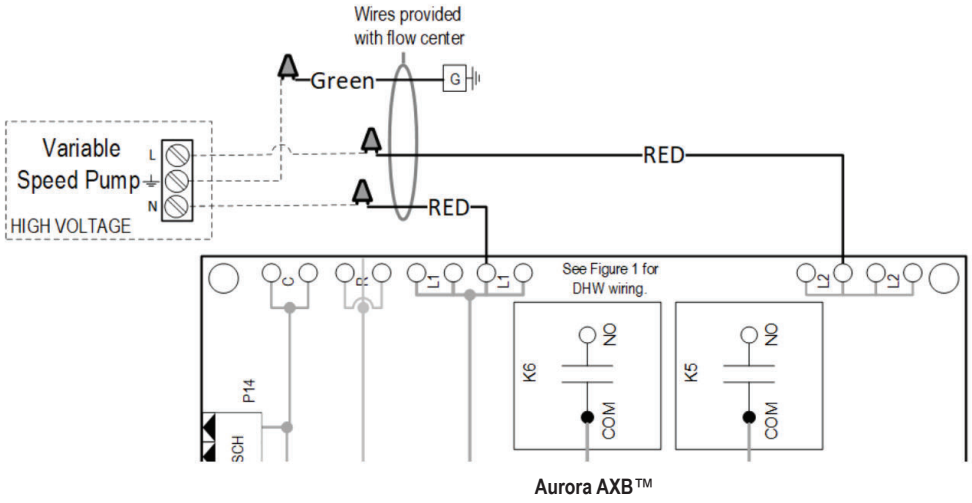
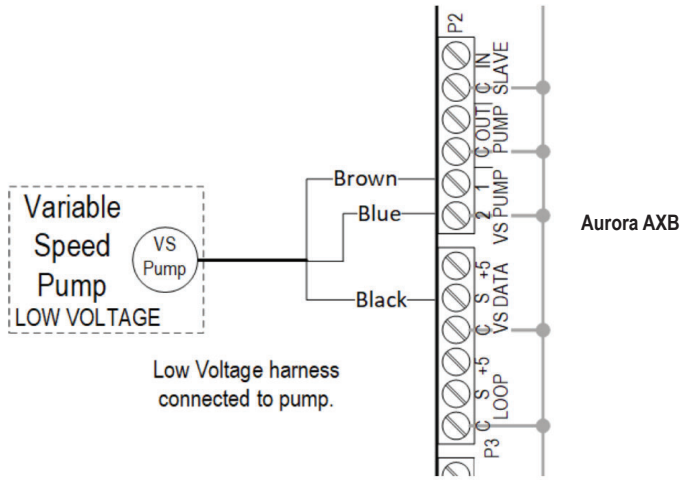


Figure 18: Single VS Pump Low Voltage Wiring



Note: Aurora AXB must be used to control the UPMXL 25-124 pump.

Electrical Information - Flow Centers cont.

Variable Speed Flow Center cont.

Two Pump Variable Speed Flow Center

If a variable speed two pump flow center is used, the flow center will come with four red and two green wires for the high voltage wiring. The second set of (2) red and (1) green wires is provided for installation flexibility. The variable speed pump MUST be powered at all times and therefore **MUST** be wired to the "L" side of electrical system or damage to the pump will occur (pump cannot be powered from "T" side of compressor contactor). The UPMXL 25-124 pump has screw terminals for the high voltage connection. Connect the red HIGH VOLTAGE wires to L1 and L2 on the AXB, connect the green GROUND wire to the ground lug, as shown in figure 20. The low voltage wiring (PMW) will turn the pump(s) ON and OFF. Follow all electrical and local codes for wiring.

The variable speed UPMXL 25-124 pump also requires a low voltage signal to operate properly, if the low voltage wires aren't connected or the signal isn't present the pump will run at 100%. Route the low voltage harness connected to the right hand pump to the AXB screw terminals on P2 and P3 connectors. Route the low voltage harness connected to the left hand pump to the AXB screw terminals on P2 and P3 connector per figure 19. The black wire on the left hand pump will have a label on it that reads **"DO NOT CONNECT THIS WIRE. ONLY ONE VS PUMP FEEDBACK SIGNAL CAN BE CONNECTED TO AXB BOARD".**

Both the low and high voltage harnesses are labeled. The pump will be automatically cycled as required either by the unit or by a signal from another unit sharing the same flow center. Pumps are protected by circuit breakers as shown on the unit schematic.

NOTE: Both pumps will speed up and slow down together.

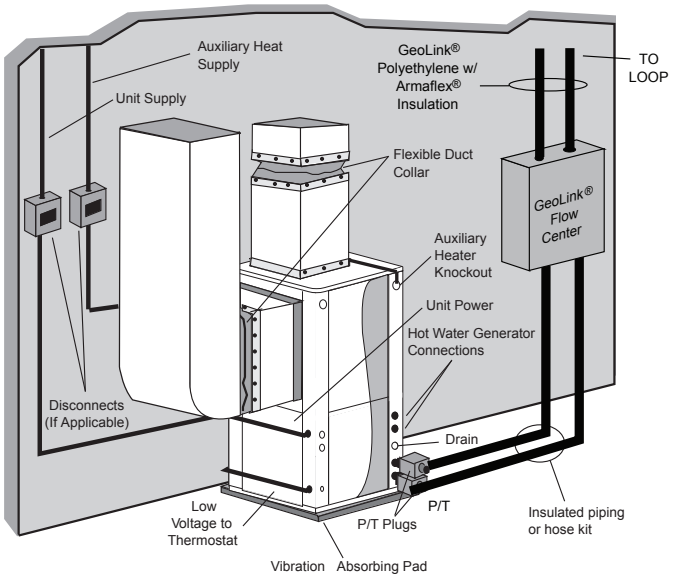
Closed Loop Ground Source Systems

NOTE: For closed loop systems with antifreeze protection, set SW2-1 to the "LOOP" (15°F) position. (Refer to the DIP Switch Settings table in the Aurora Control section.)

Once piping is completed between the unit, pumps and the ground loop (see figure below), final purging and charging of the loop is required. A flush cart (or a 1.5 HP pump minimum) is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. Flush the system adequately to remove as much air as possible then pressurize the loop to a static pressure of 40-50 psi (summer) or 50-75 psi (winter). This is normally adequate for good system operation. Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when initially charging the system.

After pressurization, be sure to turn the venting (burping) screw in the center of the pump two (2) turns open (water will drip out), wait until all air is purged from the pump, then tighten the plug. Ensure that the loop pumps provide adequate flow through the unit(s) by checking the pressure drop across the heat exchanger and comparing it to the unit capacity data in this catalog. 2.5 to 3 gpm of flow per ton of cooling capacity is recommended in earth loop applications.

Figure 7: Closed Loop Ground Source Application



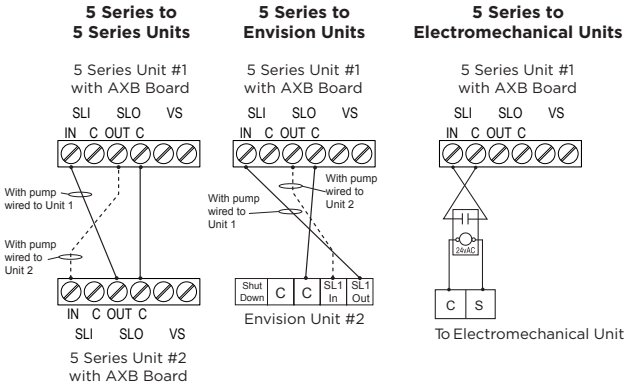
NOTE: Additional information can be found in Flow Center installation manual and Flush Cart manual.

Multiple Units on One Flow Center

NOTE: This feature is only available in the Aurora Advanced Control package (AXB board), NOT the Aurora Base Control (ABC).

When two units are connected to one loop pumping system, pump control is automatically achieved by connecting the SL terminals on connector P2 in both units with 2-wire thermostat wire. These terminals are polarity dependant (see Figure 8b). The loop pump(s) may be powered from either unit, whichever is more convenient. If either unit calls, the loop pump(s) will automatically start. The use of two units on one flow center is generally limited to a total of 20 gpm capacity. It is recommended that water solenoid valves be installed on heat pumps that share a flow center. This is to allow water flow through only the heat pump that has a demand. Circulating fluid through a heat exchanger of a system that is not operating could be detrimental to the long term reliability of the compressor.

Figure 8: Primary/Secondary Hook-up



Open Loop Ground Water Systems

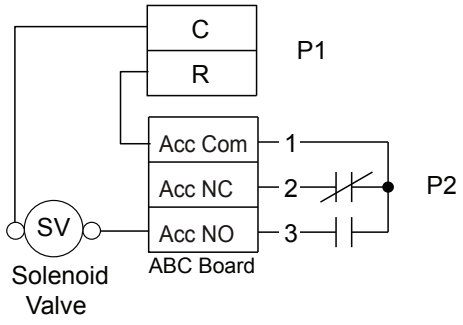
Variable Speed Pump Setup

When using a variable speed pump flow center (FCV1-GL or FCV2-GL) the use of an AID Tool will be necessary to adjust minimum and maximum flow rates. The factory default is: minimum=75% and maximum=100% speed levels. Typical open loop piping is shown below. Always maintain water pressure in the heat exchanger by placing water control valves at the outlet of the unit to prevent mineral precipitation. Use a closed, bladder-type expansion tank to minimize mineral formation due to air exposure. Ensure proper water flow through the unit by checking pressure drop across the heat exchanger and comparing it to the figures in unit capacity data tables in the specification catalog. 1.5-2 gpm of flow per ton of cooling capacity is recommended in open loop applications.

Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local codes, i.e. recharge well, storm sewer, drain field, adjacent stream or pond, etc. Most local codes forbid the use of sanitary sewer for disposal. Consult your local building and zoning departments to assure compliance in your area.

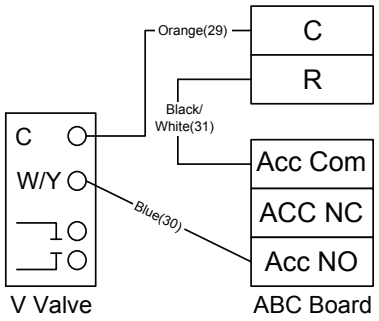
NOTE: For open loop/groundwater systems or systems that do not contain an antifreeze solution, set SW2-Switch #1 to the "WELL" (30°F) position. (Refer to the DIP Switch Settings table in the Aurora Control section.) Slow opening/closing solenoid valves (type V100FPT) are recommended to eliminate water hammer.

Figure 9a: Open Loop Solenoid Valve Connection Option
Typical quick operating external 24V water solenoid valve (type PPV100 or BPV100) wiring.



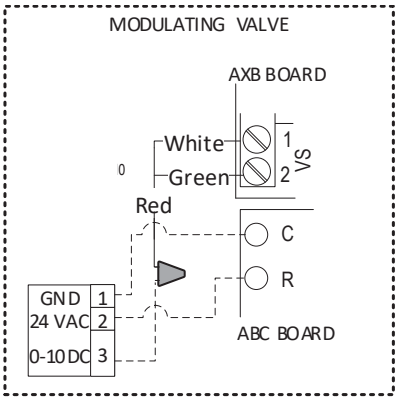
NOTE: SW2-4 and SW2-5 should be "OFF" to cycle with the compressor.

Figure 9b: Open Loop Solenoid Valve Connection Option
Typical slow operating external 24V water solenoid valve (type V100FPT) wiring.



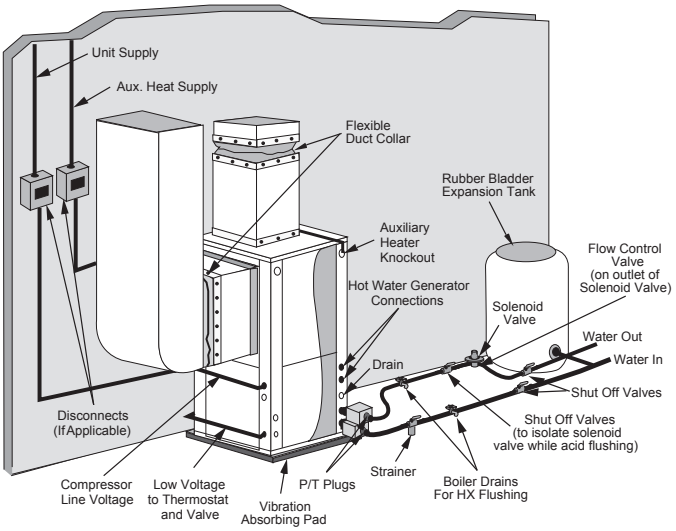
NOTE: SW2-4 should be "ON" and SW2-5 should be "OFF" when using a slow opening (V100FPT) water valve.

Figure 9c: Modulating Water Valve Connection Option
Typical 0-10VDC modulating water valve.



NOTE: Wiring harness in kit must be installed for proper value operation.

Figure 10: Open System - Groundwater Application



Compressor & Thermistor Resistance

Model	Compressor Model No.	208-230/60/1	
		Run	Start
018	YAS16K1E-PFV	1.20 - 1.38	1.66 -1.91
024	YAS20K1E-PFV	0.99 - 1.14	1.54 - 1.77
030	YAS26K1E-PFV	0.74 - 0.85	1.68 - 1.93
036	YAS30K1E-PFV	0.67 -0.78	1.37 - 1.57
042	YAS35K1E-PFV	0.48 - 0.55	1.29 - 1.49
048	YAS40K1E-PFV	0.41 - 0.47	1.54 - 1.78
060	YAS51K1E-PFV	0.35 - 0.41	1.34 - 1.55
072	YAS60K1E-PFV	0.31 - 0.35	1.30 - 1.50

1/30/24

Thermistor Temperature (°F)	Microprocessor Resistance (Ohms)
5	75757-70117
14	57392-53234
23	43865-40771
32	33809-31487
41	26269-24513
50	20570-19230
59	16226-15196
68	12889-12093
77	10310-9688
86	8300-7812
95	6723-6337
104	5480-5172
113	4490-4246
122	3700-3504
131	3067-2907
140	2554-2424
149	2149-2019

2/5/24

Reference Calculations

Heating Calculations:	Cooling Calculations:
$LWT = EWT - \frac{HE}{GPM \times 500^*}$	$LWT = EWT + \frac{HR}{GPM \times 500^*}$

NOTE: * When using water.

Legend

Abbreviations and Definitions

HWR = Hot Water Return
HWS = Hot Water Supply
CWR = Cold Water Return
CWS = Cold Water Supply
HVR = Heat Recovery Return
HVS = Heat Recovery Supply
HVP = High Voltage Panel
LVP = Low Voltage Panel
TC = Total Cooling Capacity in MBTUH
MBTUH = Thousands of British Thermal Units per hour
LWT = Leaving Water Temperature
EWT = Entering Water Temperature
EER = Energy Efficiency Ratio (TC/kW)
COP = Coefficient of Performance (HC/kW x 3.413)
PSI = Pressure drop in pounds per square inch
HC = Heating Capacity in MBTUH
HE = Heat of Extraction in MBTUH
kW = kilowatt
ft hd = pressure drop in feet of head
HR = Heat of Rejection

Preventative Maintenance

Proper maintenance is very important to obtain optimum performance and longevity for the heat pump system. It is best to establish a periodic maintenance schedule with the installer so the heat pump system can be checked regularly.

Water Coil Maintenance

1. Keep all air out of the water. An open loop system should be checked to ensure that the well head is not allowing air to infiltrate the water line. Lines should always be airtight.
2. Keep the system under pressure at all times. It is recommended in open loop systems that the water control valve be placed in the discharge line to prevent loss of pressure during off cycles. Closed loop systems must have positive static pressure.

NOTE: On open loop systems, if the installation is in an area with a known high mineral content (125 PPM or greater) in the water, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. Should periodic coil cleaning be necessary, use standard coil cleaning procedures which are compatible with the heat exchanger and copper water lines. Generally, the more water flowing through the unit the less chance for scaling. However, flow rates above 3gpm/ton may erode the heat exchanger or water lines, due to high water velocity or system debris.

Other Maintenance

Filters

Filters must be clean to obtain maximum performance. They should be inspected monthly under normal operating conditions and be replaced when necessary. Units should never be operated without a filter. Operating the system without a filter or with a dirty filter could affect the longevity of the heat pump.

Condensate Drain

In areas where airborne bacteria produce a slime in the drain pan, it may be necessary to treat chemically to minimize the problem. The condensate drain can pick up lint and dirt, especially with dirty filters. Inspect twice a year to avoid the possibility of overflow.

Blower Motors

ECM blower motors are equipped with sealed ball bearings and require no periodic oiling.

Hot Water Generator Coil

See Water Coil Maintenance section above.

Air Coil

The air coil must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum (with a brush attachment) clean. Care must be taken not to damage the aluminum fins while cleaning.

CAUTION: Fin edges are sharp.

Replacement Procedures

Obtaining Parts

When ordering service or replacement parts, refer to the model number and serial number of the unit as stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and the date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

In-Warranty Material Return

Material may not be returned except by permission of authorized warranty personnel. Contact your local distributor for warranty return authorization and assistance.

Troubleshooting

Aurora Control System

NOTE: Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.

To check the unit control board for proper operation:

1. Disconnect thermostat wires at the control board.
2. Jumper the desired test input (Y1, Y2, W, O or G) to the R terminal to simulate a thermostat signal.
3. If control functions properly:
    - Check for thermostat and field control wiring (use the diagnostic inputs mode).
4. If control responds improperly:
    - Ensure that component being controlled is functioning (compressor, blower, reversing valve, etc.).
    - Ensure that wiring from control to the component is correct.
    - Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.

Refrigerant Systems

To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Compare the change in temperature on the air side as well as the water side to the Unit Operating Parameters tables. If the unit's performance is not within the ranges listed, and the airflow and water flow are known to be correct, gauges should then be installed and superheat and subcooling numbers calculated. If superheat and subcooling are outside recommended ranges, an adjustment to the refrigerant charge may be necessary.

NOTE: Refrigerant tests must be made with hot water generator turned "OFF". Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

Aurora Interface Diagnostic (AID) Tool

Aurora Input-Output Diagnostics

Troubleshooting the Aurora logic board can be accomplished using nothing more than a couple of jumper wires and a volt meter. The process can be simplified with the use of the Aurora Interface Diagnostic Tool (AID Tool). The AID Tool allows the user to see lockout and fault history information, thermostat inputs, sensor inputs, system outputs, timer, etc.

Aurora ABC Checkout

Before replacing the Aurora ABC control board the proper troubleshooting steps must be taken to ensure that the board is the root cause. On the following pages are several flow charts that will assist in checking the control board. If it is found that the control board is faulty, contact technical services for a replacement part.

LED Displays

Slow Flash = 1 second on and 1 second off
Fast Flash = 100 ms on and 100 ms off
Flash Code = 100 ms on and 400 ms off with a 2 second pause between packages

SW1 Operation

Holding SW1	Description of Operation	LED
2 to 5 sec	Enter Test Mode	Green LED Slow Flash
5 to 10 sec	Enter ECM Configure Mode	Yellow LED Off
50 to 60 sec	Reset Configure Mode (default)	Yellow LED Off
> 60 sec	SW1 Operation Cancel	Yellow LED Back to Normal

"SW1 operation cancel," holding SW1 for longer than 60 seconds operation will be cancelled. Yellow LED will go back to normal operation.

Fault Retries Before Lockout

Type of Fault	Total Tries Before Lockout
High Pressure	3 Retries
Low Pressure	3 Retries
Freeze Detection 1 - (Coax)	3 Retries
Freeze Detection 2 - (Air coil)	3 Retries
Condensate Overflow	3 Retries
Over/Under Voltage Shutdown	No Lockout
Compressor Monitor	No Retry
Freeze Detection Sensor Error (Sensor is out of range)	No Retry

Preliminary Checkout Procedure

Troubleshooting liquid source heat pumps with Aurora controls is an easy and straight forward process. Most service problems are related to water flow (insufficient or too cold). Also, most service problems can be fixed without connecting refrigerant manifold gauges.

The first item to check is system performance which can be done in six steps. Before beginning make sure the hot water generator pump is disconnected.

STEP 1: Check and/or set source water flow. Refer to the install manual for the specific piece of equipment's correct water flow setting.

STEP 2: Check the temperature difference through the coaxial heat exchanger and compare to the Operating Parameters table in the equipment install manual.

STEP 3: Check the air temperature rise/drop and compare to the Operating Parameters table in the equipment's installation manual.

STEP 4: If the first three steps check out, perform a heat of extraction/rejection test as described in the Water Side Analysis: Heat of Extraction/Rejection section to confirm proper operation.

STEP 5: If any or all of the above steps do not check out, be sure that the air coil and filter are clean.

STEP 6: Check superheat and subcooling by placing refrigeration gauges on the unit. Compare superheat and subcooling values with the charts in the equipment installation manual.

If the above six steps do check out, it would be safe to assume that the unit is performing well and the problem must lie elsewhere, i.e. excessive heat loss/gain in the structure or duct system, (undersized duct and/or registers, etc.)

If you suspect a specific problem, refer to the Table of Contents and select the reference that most closely matches the situation encountered. If problems persist after completing the preliminary checkout procedure, refer to the Troubleshooting Checklist. Select the problem which is closest to the situation you have encountered.

Troubleshooting Checklist

Equipment will not start or operate

- Follow the troubleshooting flow charts to find root cause.

High pressure lockout in the heating mode

- Check for air flow interruption from one or more of the following: inoperative blower, dirty filters or air coil, blocked return air grille, closed or blocked supply registers, restricted supply or return duct, zone dampers, etc. If airflow is suspected as being a problem, make a quick check using the following example: Velocity in a supply duct should not exceed 1000 fpm and 700 fpm in return ducts. For this example we will use an model 038 which has a maximum rating of 1500 cfm at 0.50 static (Refer to the blower performance tables in the install manual for your particular piece of equipment). Using the formula: Area in square feet equals quantity in cfm divided by velocity in fpm (A=cfm/fpm), 1.57 sq. ft. is needed for the supply duct and 2.14 sq. ft. is needed for the return duct. Refer to the troubleshooting flow charts if a problem with the blower motor or logic board is suspected.
- Check for blocked or seized expansion device.
- Make sure the discharge pressure is within the operating range shown in this product manual.
- The unit may be overcharged; check superheat and sub cooling. If this problem is verified, recharge using approved methods.

High pressure lockout in the cooling mode

- Water flow may be restricted or inadequate. Verify in accordance with the pressure drop tables shown in product install manual. Also, look for the following: solenoid valve may not be opening on well water units, pump(s) may be inoperative in the flow center, debris may be blocking coil (back flush using at least 20 PSI), or air may be in the loop (flush loop).
- Water to refrigerant heat exchanger may be fouled with debris. If so, back flush with at least 20 psi of water pressure.
- If mineral accumulation is evident, clean the heat exchanger with acid.
- Entering air temperature may be too high. Equipment is designed for a maximum of 85°F DB and 71°F WB.
- Check for a seized or blocked expansion device.
- The unit may be overcharged; check superheat and sub cooling. If this problem is verified, recharge using approved methods.

Low pressure lockout in heating mode

- If equipment is installed in a low temperature area (below 50°F), install a crankcase heater, then protect the unit from the elements.
- Water flow may be restricted or inadequate. Verify in accordance with the pressure drop tables shown in this product manual. Also, look for the following: solenoid valve may not be opening on well water units, pump(s) may be inoperative in the flow center, debris may be blocking coil (back flush using at least 20 PSI), or air may be in the loop (flush loop).
- Check for a seized or blocked expansion device.
- Return air temperature may be below 50°F. Block off air coil temporarily to improve flow of refrigerant through the system. Air below 50°F cannot be tolerated on a continuing basis. Correct the problem.
- Refrigerant may be low. Check for leaks, reclaim refrigerant, repair if necessary, recharge using approved methods.

Low pressure lockout in the cooling mode

- Check for inadequate air flow. Follow the same procedure as shown for a high pressure lockout in the heating mode.
- Check for a seized or blocked expansion device.
- Refrigerant charge may be low.

Water flow lockout in either the heating or cooling mode

- Water flow may be restricted or inadequate. Verify in accordance with the pressure drop tables shown in product install manual. Also, look for the following: solenoid valve may not be opening on well water units, pump(s) may be inoperative in the flow center, debris may be blocking coil (back flush using at least 20 PSI), or air may be in the loop (flush loop).
- Disconnect freeze sensor from control and measure the resistance. Cross reference with the Thermistor Data table.

Condensate over flow lockout in either the heating or cooling mode

- Make sure the drain line pitches away from the unit. Install a vertical vent on horizontal drain lines over six feet long. Clean condensate pan and be sure outlet and drain line from the condensate pan is clear.

Reversing valve does not operate

- Disconnect solenoid and check for continuity across coil. Replace coil if continuity is not found.
- If stuck reversing valve is suspected, restrict airflow in heating mode (to build pressure), then switch immediately to the cooling mode.

Control Board Troubleshooting Steps

1) General Check

- If any new device was installed, or any wiring was changed, check the connections to ensure the wiring is correct, and all the wires are in good condition.
- Verify all the plugs are securely connected and in good condition.
- Check the DIP switch (SW2) positions are correct.
- Measure 24 VAC between R and C. (The actual reading may be from 18 to 30 VAC). Check the incoming power and the power transformer if the R and C voltage reading is not correct.

2) No LEDs are On

- Check 24 VAC on board.
- Check the 3 amp fuse. Replace the fuse if needed.
- Verify transformer circuit breaker has not tripped if no low voltage is present.
- Disconnect the thermostat connection P1.
- Replace the Aurora base control board.

3) Red LED Flash Code

Input Fault (Code 1) – Indicates that both O and W input signals are present. Disconnect the thermostat connector from the ABC board and then cycle power to the board. If the fault does not reappear, then the problem is between the thermostat and the thermostat connector. Otherwise, replace the ABC board.

High Pressure Fault (Code 2) – Indicates the system pressure has exceeded 600 psi (R-410A) which may have been caused by low water flow in cooling, (check coaxial heat exchanger for mineral build-up) or low air flow in heating (check filters and coil for dirt build-up). Measure P4-9 and C is 24 VAC. If not, replace ABC. Check the heat pump refrigeration system. Cycle the power to reset the system. Measure P4-10 and C is 24 VAC. If not, replace the high pressure sensor.

Low Pressure Fault (Code 3) – Indicates low pressure switch has opened which may indicate a loss of system charge, system restriction, or frozen heat exchanger. Measure P4-7 and C is 24 VAC. If not, replace ABC. Check the heat pump refrigeration system. Cycle the power to reset the system. Measure P4-8 and C is 24 VAC. If not, replace the low pressure sensor. Refrigerant may be low. Check for leaks, reclaim refrigerant, repair if necessary, pump down and recharge the system to the quantity of refrigerant shown on the unit nameplate.

Freeze Detection 1 Fault (Code 5) – Indicates low or no water flow; low system charge; or faulty expansion device in heating mode. Make sure the DIP switch FP1 (SW2-1) selection matches the application. Measure the temperature on the refrigerant line next to the freeze detection thermistor. Disconnect the connector P4. Measure the resistance reading between P4-3, P4-4. Refer to the Thermistor Data table, find the corresponding temperature data. Compare the data with the temperature measurement from the refrigerant line. The temperature should be within +/- 2° F. If not, replace the thermistor.

Other items to check when troubleshooting a water flow lockout are superheat, water flow through the coaxial heat exchanger and antifreeze composition. High superheat in heating will lower the refrigerant line temperature where the freeze detection thermistor is located. In this case, check the expansion device. Closed loop systems are rated at 3 gpm/ton. If a closed loop system is running at less than 3 gpm/ton, the temperature difference between the refrigerant line and the actual leaving water temperature will be greater and could lead to possible water flow lockouts.

Condensate Fault (Code 7) – Indicates condensate water in the drain pan fills up and touches the spade terminal. Make sure the drain line pitches away from the unit. Install a vertical vent on horizontal drain lines over six feet long. Clean and be sure outlet and drain line from the condensate pan is clear. Jumper between R, Y2 and O to start 2nd stage cooling. Observe the water level in the drain pan. If the unit is locking out on condensate and the drain pan is dry, remove the condensate wire from the drain pan and tape it out of the way. Be careful to not ground the wire out because that will cause the unit to lockout on drain overflow. If the unit is still locking out, check the brown wire all the way back to the ABC for a short to ground. Remember that the condensate sensor is just a wire looking for a ground. If it touches any metal in the cabinet, the unit will see that as a drain fault. If removing the wire from the drain pan stopped the false drain lockouts, put the condensate sensor back in place in the drain pan. Pay close attention to how far the spade terminal sits down in the drain pan. If the terminal is pushed all the way down so that it is touching the bottom of the drain pan, this will cause a drain lockout if there is any trace of water. If the spade terminal fits loosely in the drain pan, spread the terminal open to make it fit snugly in the drain pan.

Over/Under Voltage Shutdown Fault (Code 8) – Indicates the control voltage is or had been outside the range of 18 to 30 VAC for more than 15 minutes. Using a voltage meter, check the incoming power line voltage is within + or – 25%. If not, there is a power line issue. Check the secondary of the control transformer with a voltage meter. The voltage should be 18 to 30 VAC. If not, replace the control transformer.

Freeze Detection FP1 Sensor Fault (Code 11) – Indicates the freeze detection sensor is out of range. Disconnect the connector P4. Measure the resistance reading between P4-3, P4-4. Refer to the Thermistor Data table, find the corresponding temperature data. Compare the data with the temperature measurement from the refrigerant line. The temperature should be within +/- 2°F. If not, replace the thermistor.

Control Board Troubleshooting Steps cont.

4) Other Faults

ECM Motor Will Not Start

1. Measure the voltage output between P13-1 and P13-5. Reference the chart below for blower speed vs. voltage.

Blower Speed Selection Number	DC Volts
1	0.6 VDC
2	2.7 VDC
3	4.6 VDC
4	7.5 VDC
5	9.8 VDC
6	12.5 VDC
7	14.4 VDC
8	16.3 VDC
9	18.5 VDC
10	21.2 VDC
11	22.3 VDC
12	23.4 VDC

2. Measure the voltage from C to F terminals (P5-2). The reading should be 24VAC.

Compressor First Stage Will Not Start – Measure the voltage output between P5-4 and P5-5, P5-7 and P5-8. The reading should be 24 VAC. If 24 VAC is not present check transformer output, thermostat wiring, current fault status, etc.

Compressor Second Stage Will Not Start – Measure the voltage output between P5-6 and P5-8. The reading should be 24 VAC. If 24 VAC is not present, check DIP switch settings, thermostat operation, and thermostat wiring.

PSC Motor Will Not Start – Measure the voltage output between P5-2 and P5-3. The reading should be 24 VAC.

No Alarm Output – Measure the voltage output between P2-4 and C. The reading should be 24 VAC or a pulsed 24 VAC dependent on the selection of SW2-7. If SW2-8 is set for reheat, the alarm output will be used to control the hot gas reheat valve and will not show lockout information.

Accessory Relay Does Not Operate – Measure the continuity between P2-2 and P2-3. It should read closed when relay is engaged. If this is not correct, check SW2-4 and SW2-5 settings.

No Lockout Output – Measure the voltage output between P1-1 and C. The reading should be 24 VDC or a pulsed 24 VDC dependent on the selection of SW2-7. If voltage is not present, make sure the unit is in lockout and not fault retry.

Auxiliary Heater Does Not Function – Measure the voltage output between P3-1, P3-2, and P3-3, P3-4. The output should be 24 VDC. If voltage is not present, check thermostat operation and wiring.

Loop Pump Does Not Start – The loop pump is controlled by the AXB board. Check to make sure the control board is powered by taking a voltage reading across R and C to check for 24VAC. If 24VAC is not present check the wiring connections, 24VAC is supplied to the AXB through the harness connected to P9. Next check to make sure the ABC is attempting to run the compressor, the loop pump will only run when the ABC is commanding CC on, the pump slave input is active, or the AXB has lost communication with the ABC. Please refer to troubleshooting flow charts for additional checks on the loop pump.

5) Operation Modes

Enter First Stage Heating – Remove P1. Place a jumper between R and Y1.

Enter Second Stage Heating – Remove P1. Place a jumper between R, Y1 and Y2. This is for SW2-6 set to “OFF” position.

Enter Third Stage Heating – Remove P1. Place a jumper between R, Y1, Y2 and W.

Enter First Stage Cooling – Remove P1. Place a jumper between R, O and Y1.

Enter Second Stage Cooling – Remove P1. Place a jumper between R, O, Y1 and Y2.

Enter Emergency Heating – Remove P1. Place a jumper between R and W.

Enter Blower Only Mode – Remove P1. Place a jumper between R and G.

Enter Reheat Mode – Remove P1. Place a jumper between R and DH. (SW2-8 must be off)

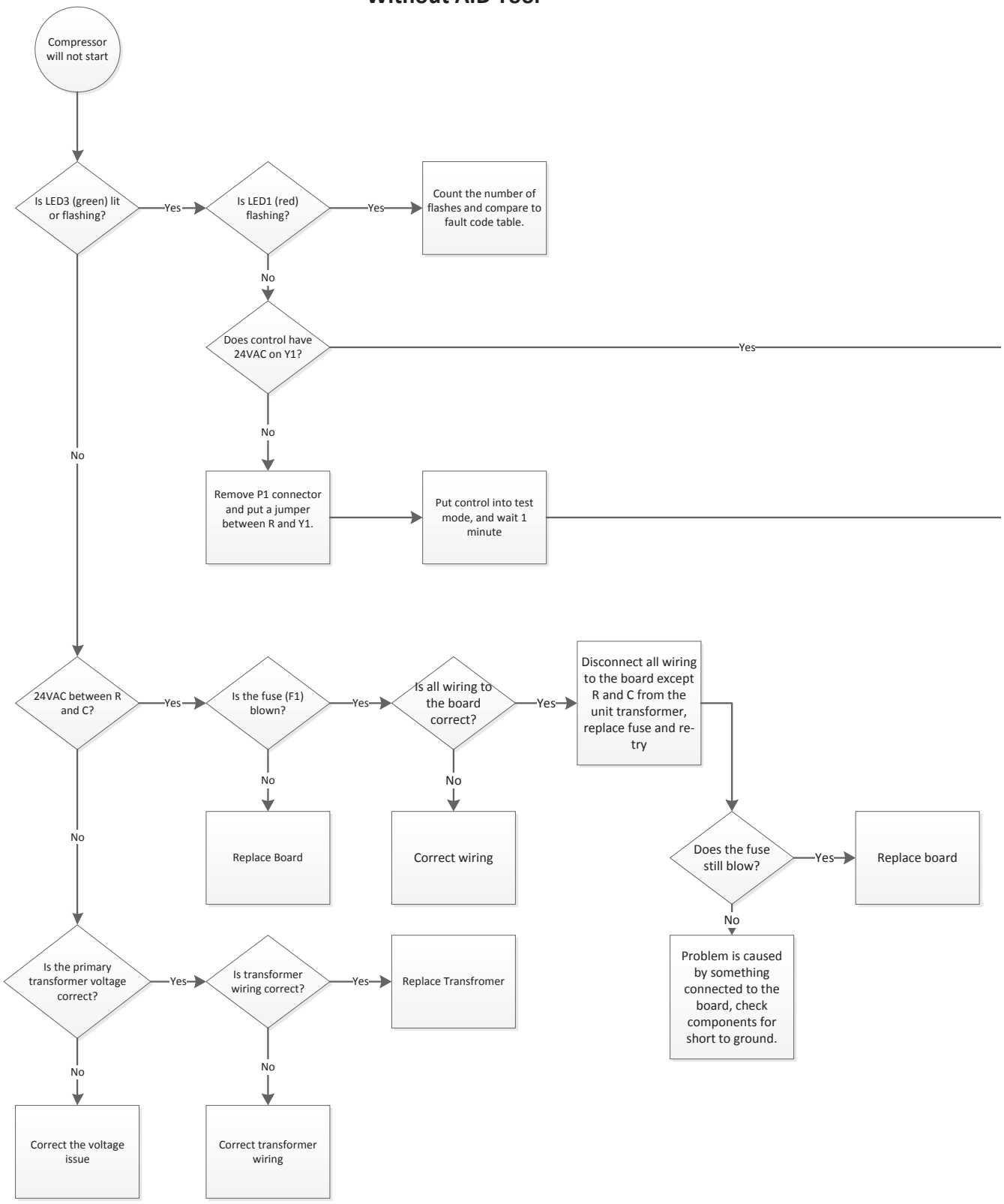
These notes are for SW2-3 set to “ON” position.

CONTROL BOARD FLOW CHARTS

Control Board Troubleshooting Flow Charts

Use the following flow charts to aid in troubleshooting the control board.

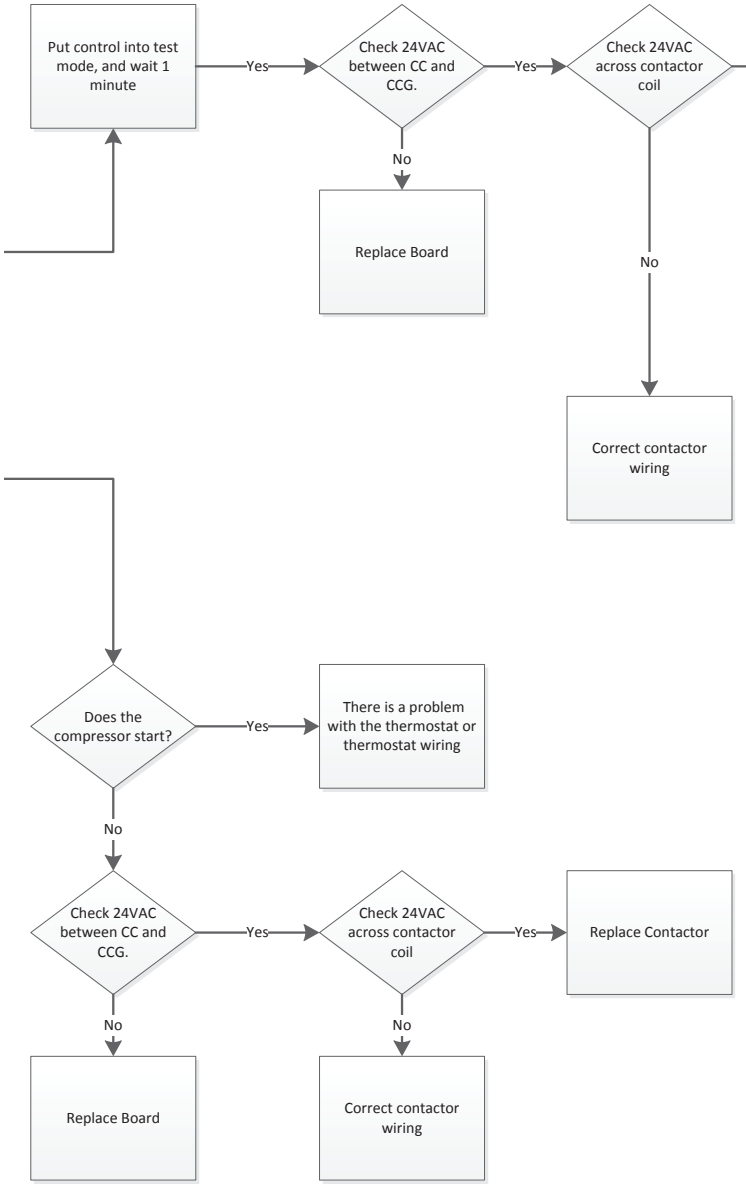
Compressor Will Not Start
Without AID Tool



Control Board Troubleshooting Flow Charts cont.

Notes:

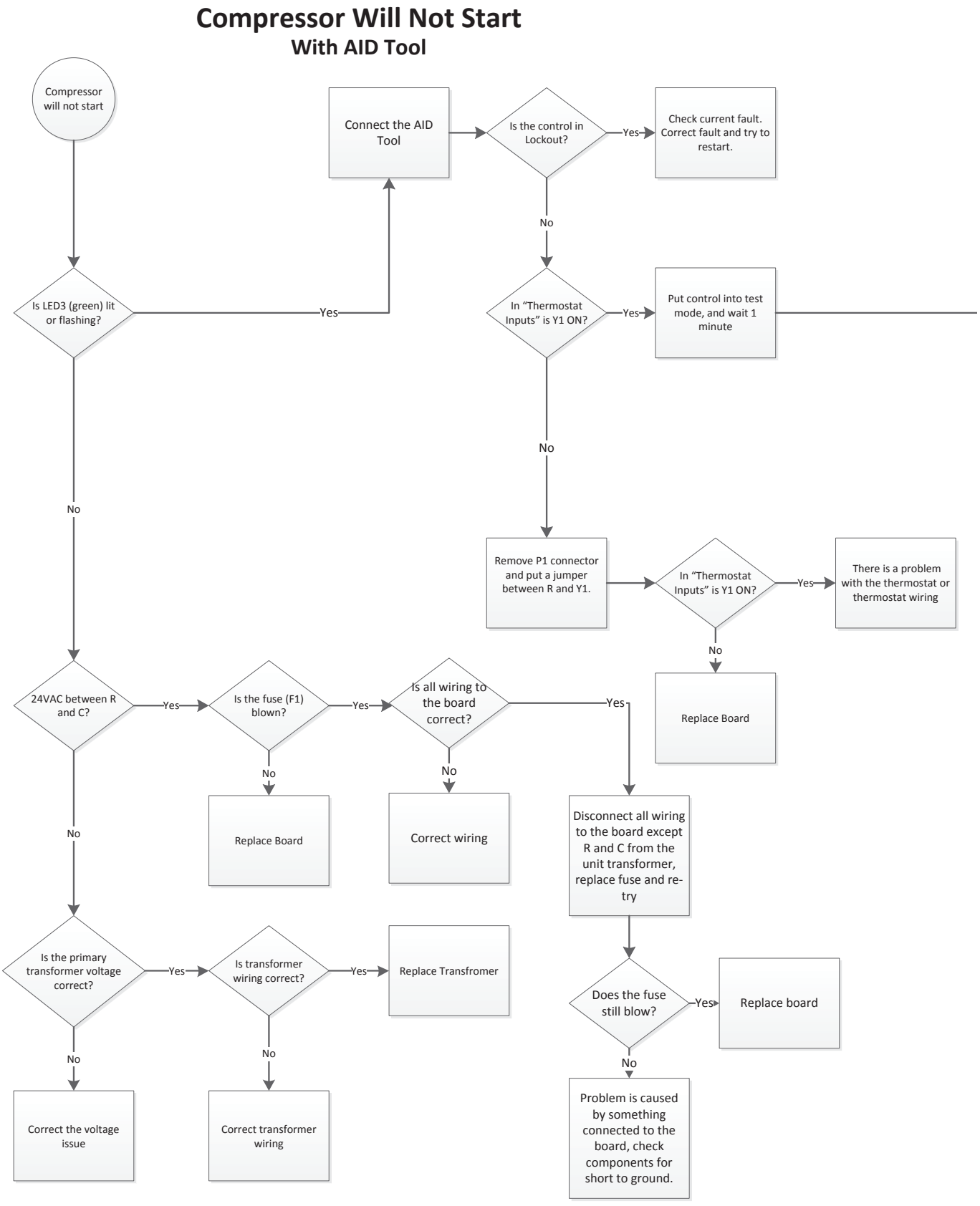
1. When measuring 24VAC actual value may be between 18 and 30VAC.



Fault Code	
Fault Description	**Flash Code**
Normal Mode	OFF
Input Fault	Code 1
High Pressure	Code 2
Low Pressure	Code 3
Freeze Detection 2	Code 4
Freeze Detection 1 (Coax)	Code 5
Reserved	Code 6
Condensate	Code 7
Over/Under Voltage	Code 8
Not Used	Code 9
Freeze Detection Sensor Error	Code 11

NOTE: Refer to the Control Board Troubleshooting Steps for fault descriptions.

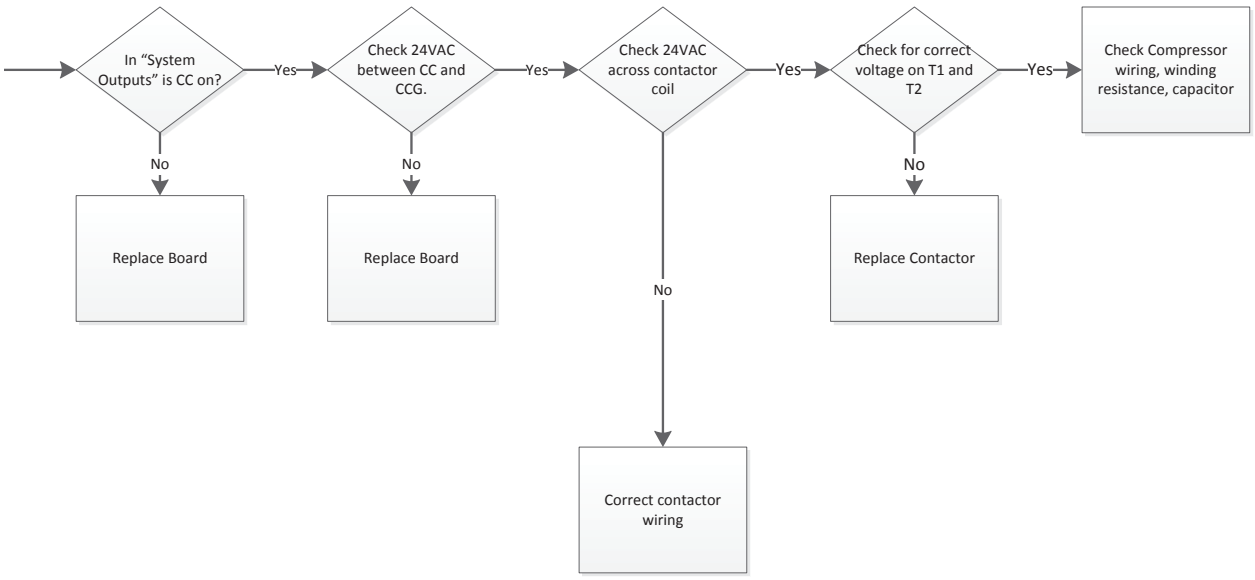
Control Board Troubleshooting Flow Charts cont.



Control Board Troubleshooting Flow Charts cont.

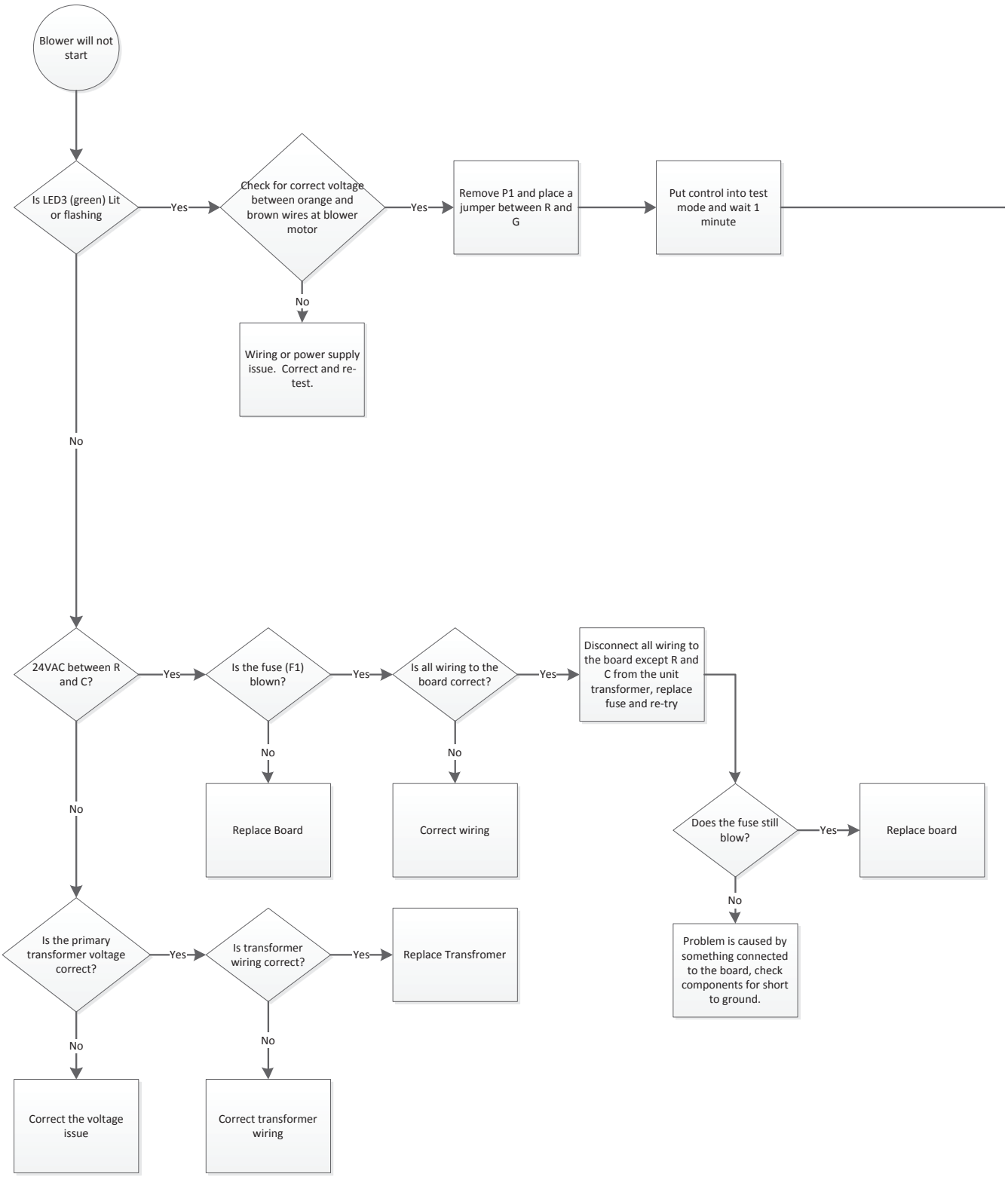
Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.



Control Board Troubleshooting Flow Charts cont.

ECM Blower Will Not Start
Without AID Tool



Control Board Troubleshooting Flow Charts cont.

Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.

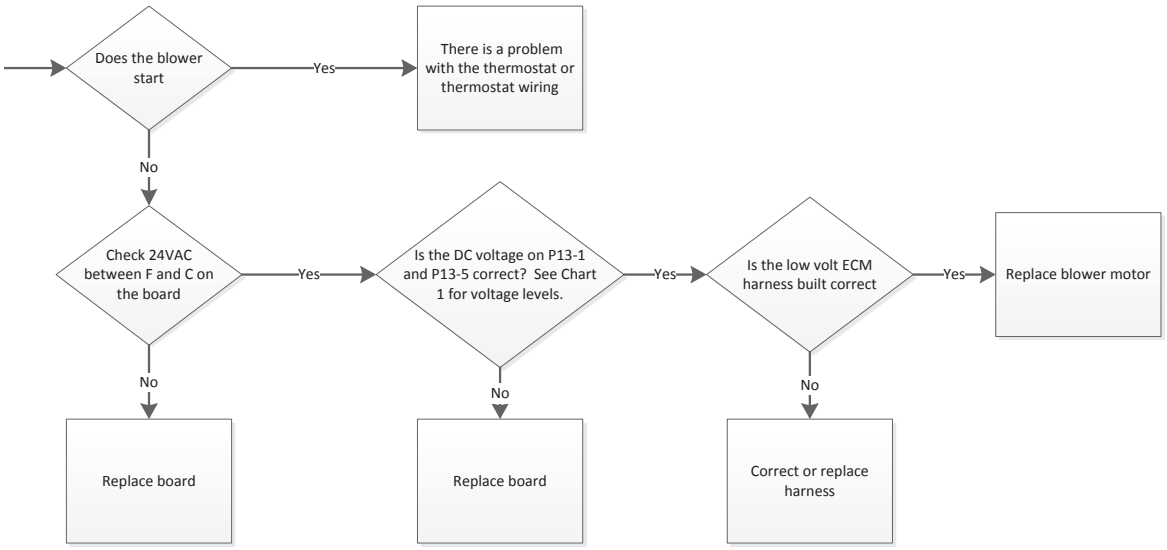


Chart 1

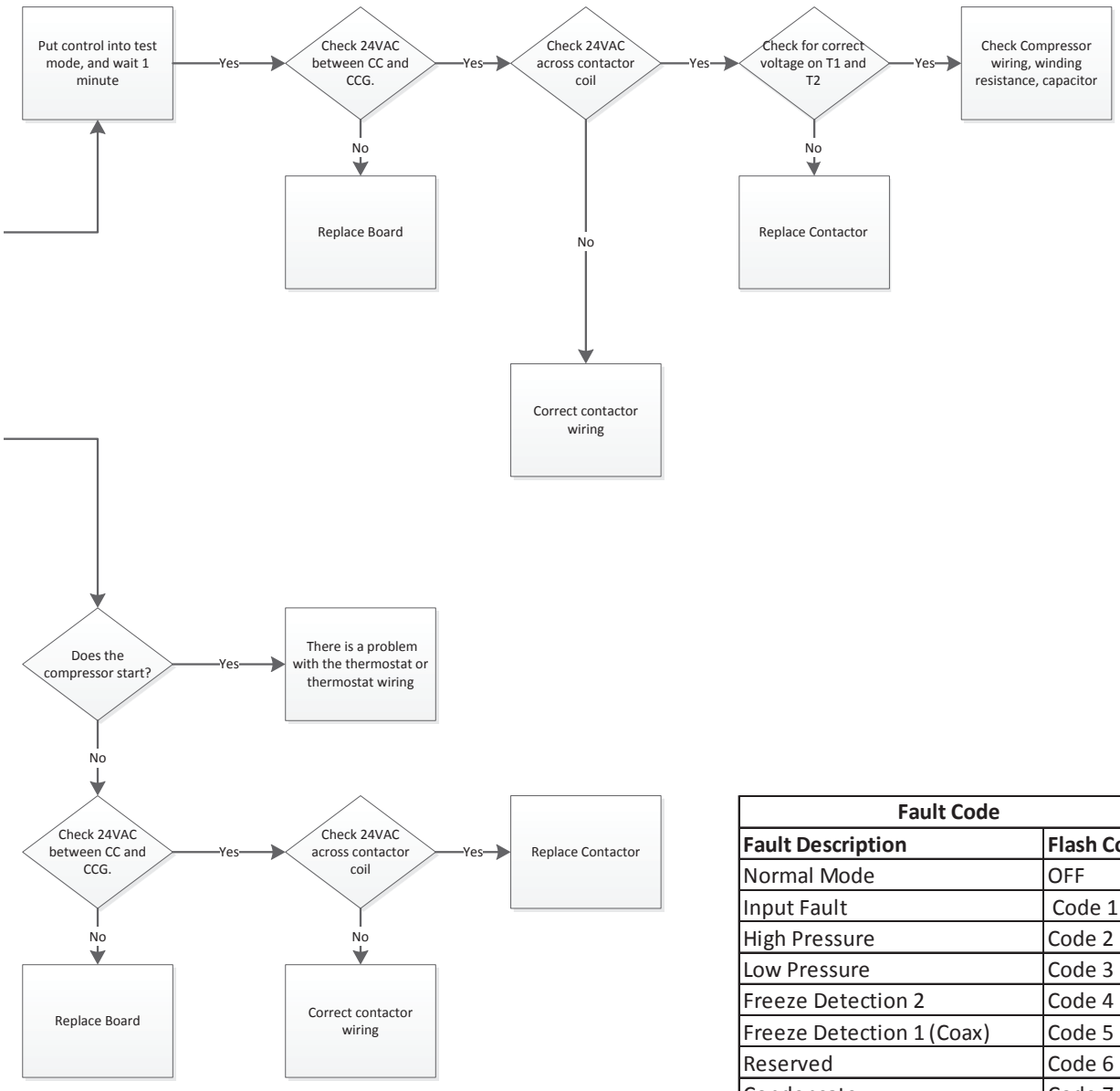
Blower Speed Selection Number	DC Volts
1	0.6VDC
2	2.7VDC
3	4.6VDC
4	7.5VDC
5	9.8VDC
6	12.5VDC
7	14.4VDC
8	16.3VDC
9	18.5VDC
10	21.2VDC
11	22.3VDC
12	23.4VDC

Control Board Troubleshooting Flow Charts cont.

Control Board Troubleshooting Flow Charts cont.

Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.

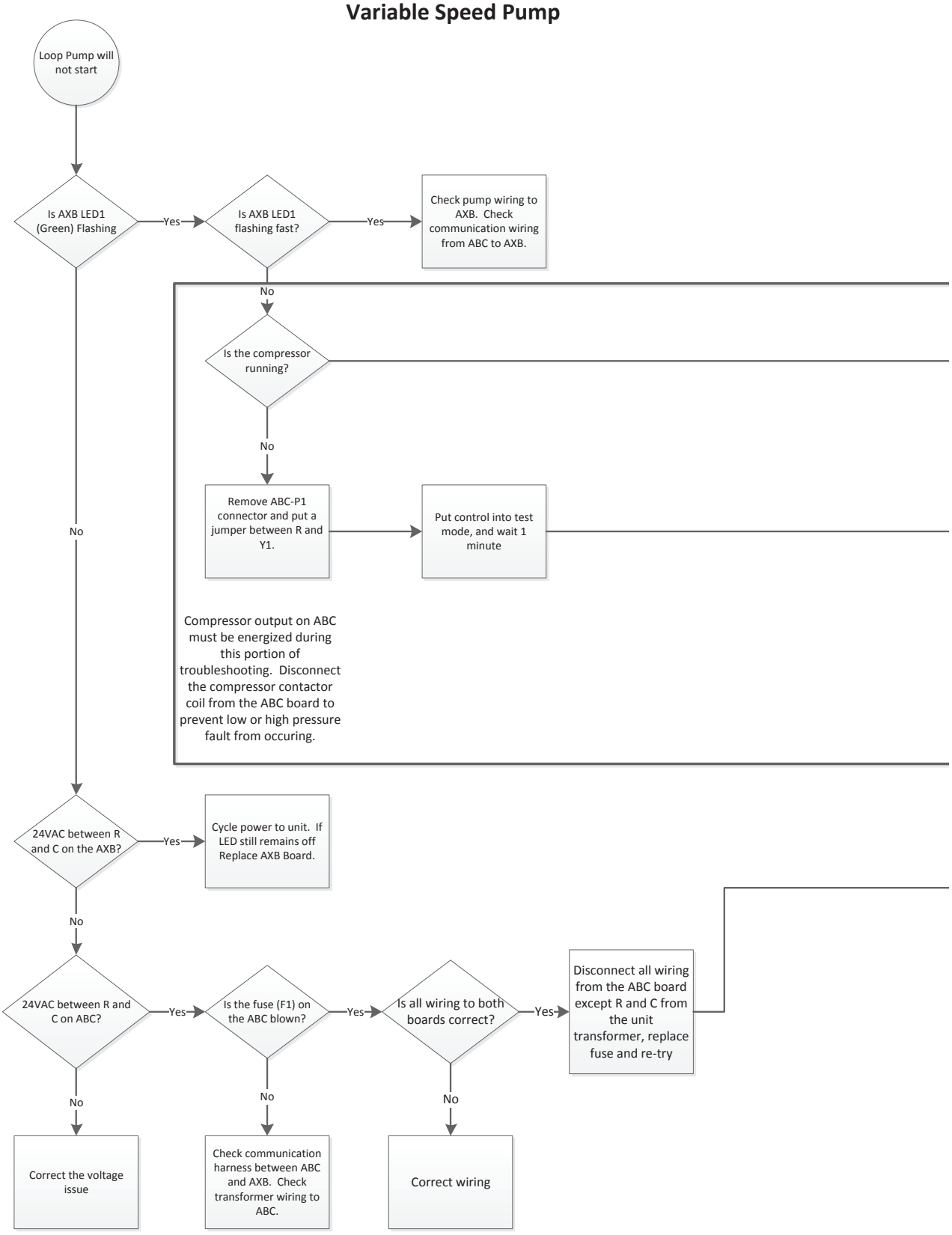


Fault Code	
Fault Description	**Flash Code**
Normal Mode	OFF
Input Fault	Code 1
High Pressure	Code 2
Low Pressure	Code 3
Freeze Detection 2	Code 4
Freeze Detection 1 (Coax)	Code 5
Reserved	Code 6
Condensate	Code 7
Over/Under Voltage	Code 8
Not Used	Code 9
Freeze Detection Sensor Error	Code 11

Control Board Troubleshooting Flow Charts cont.

Loop Pump Will Not Start

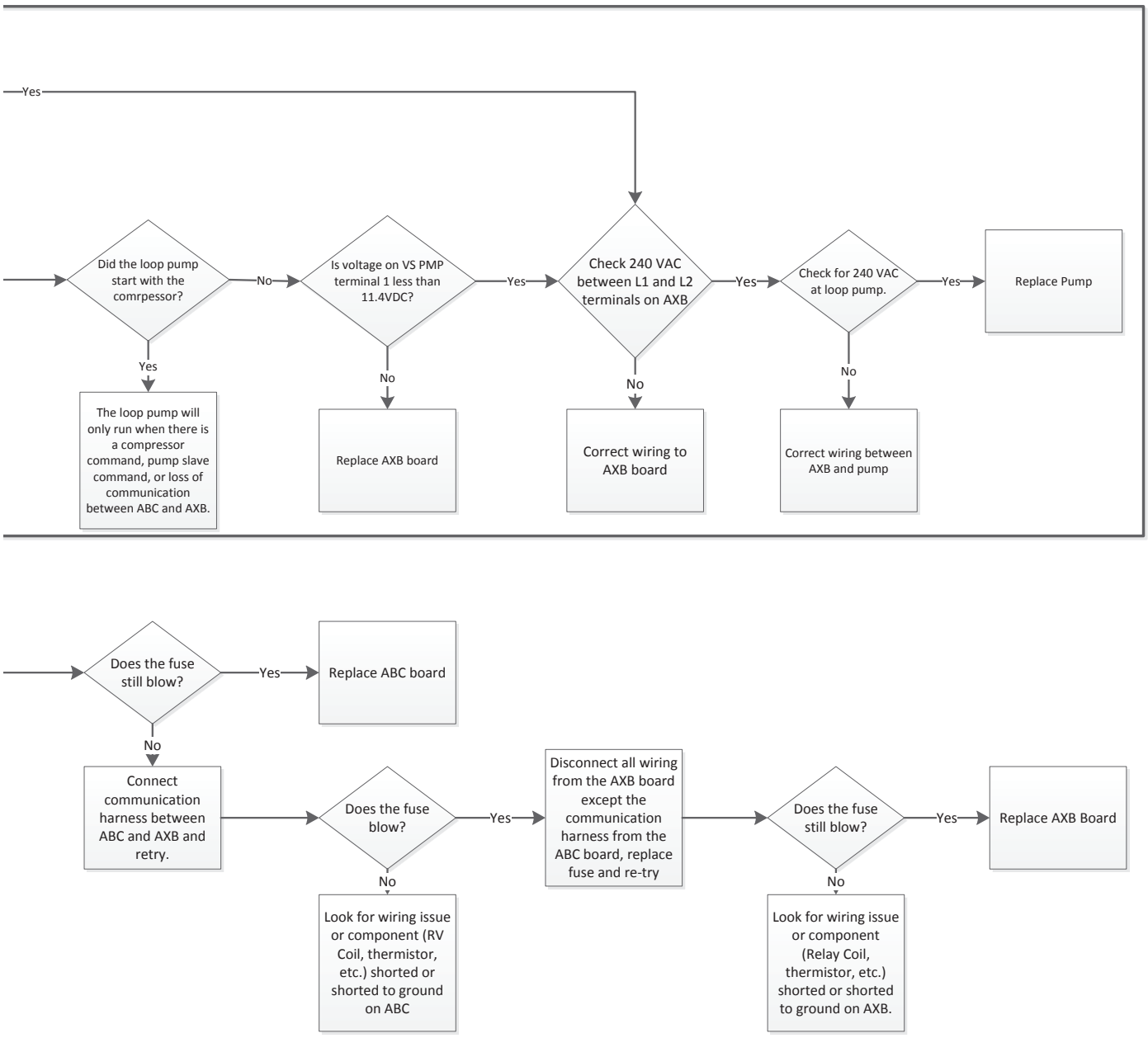
Variable Speed Pump



Control Board Troubleshooting Flow Charts cont.

Notes:

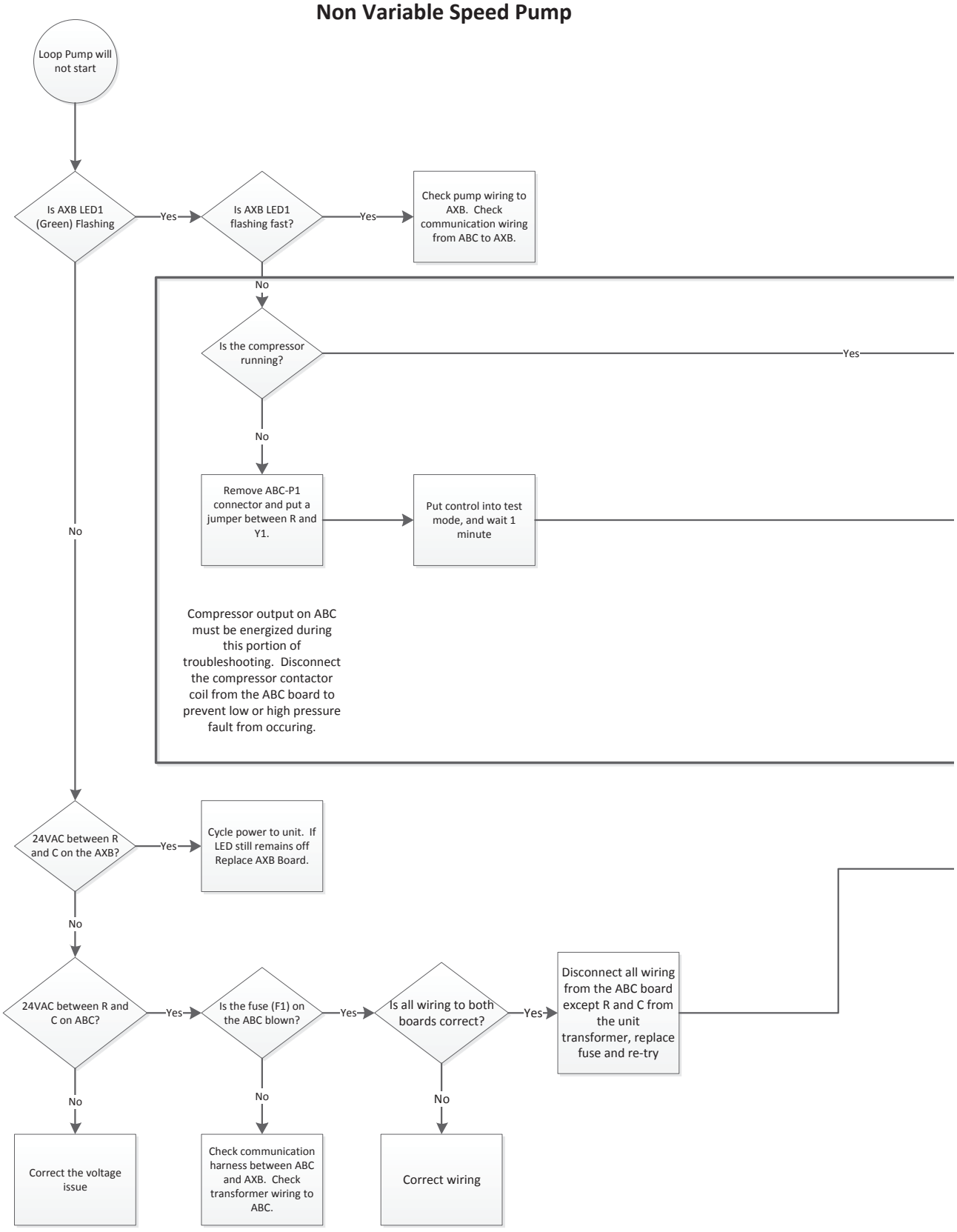
1. When measuring 24VAC actual value may be between 18 and 30VAC.
2. When measuring 240VAC actual value may be between 190 and 250 VAC.



Control Board Troubleshooting Flow Charts cont.

Loop Pump Will Not Start

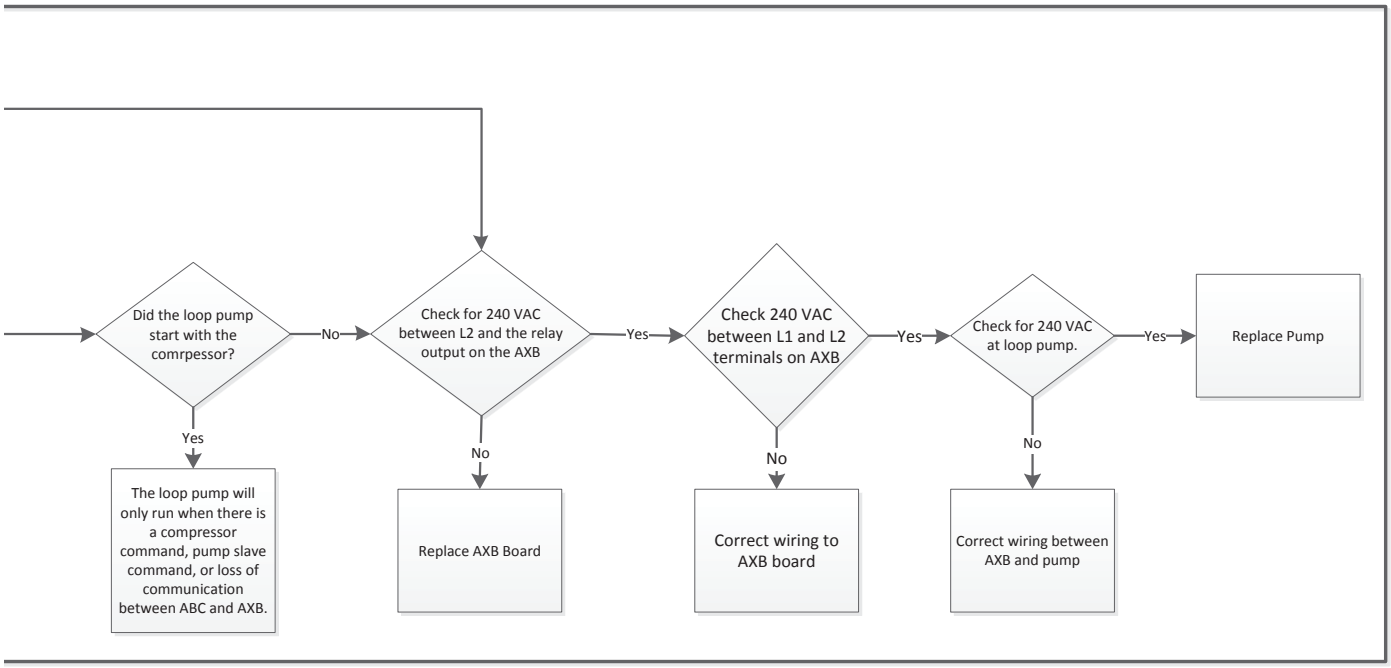
Non Variable Speed Pump

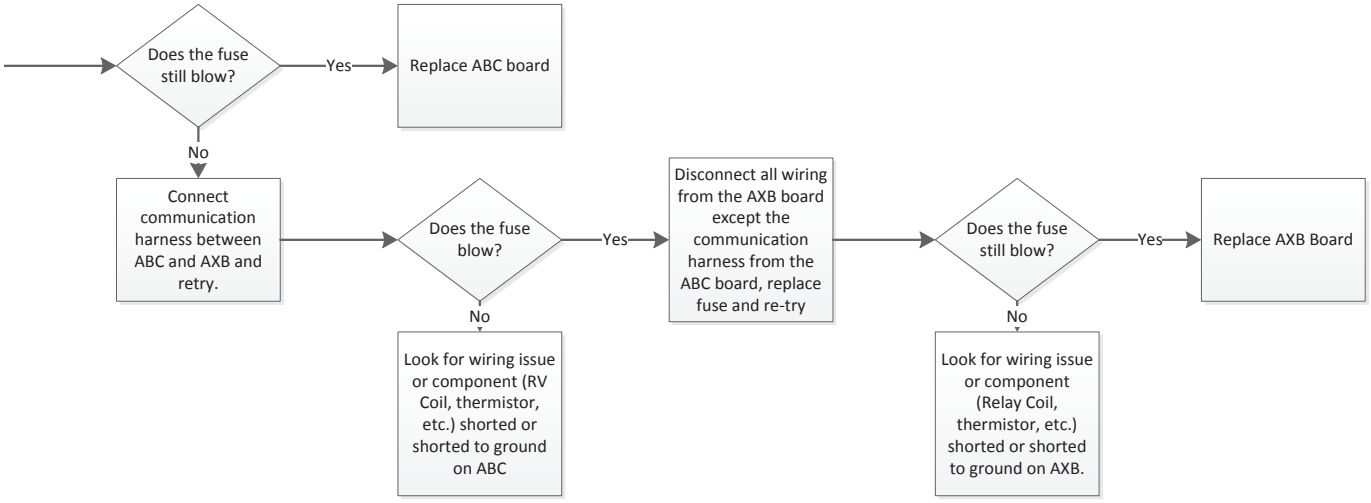


Control Board Troubleshooting Flow Charts cont.

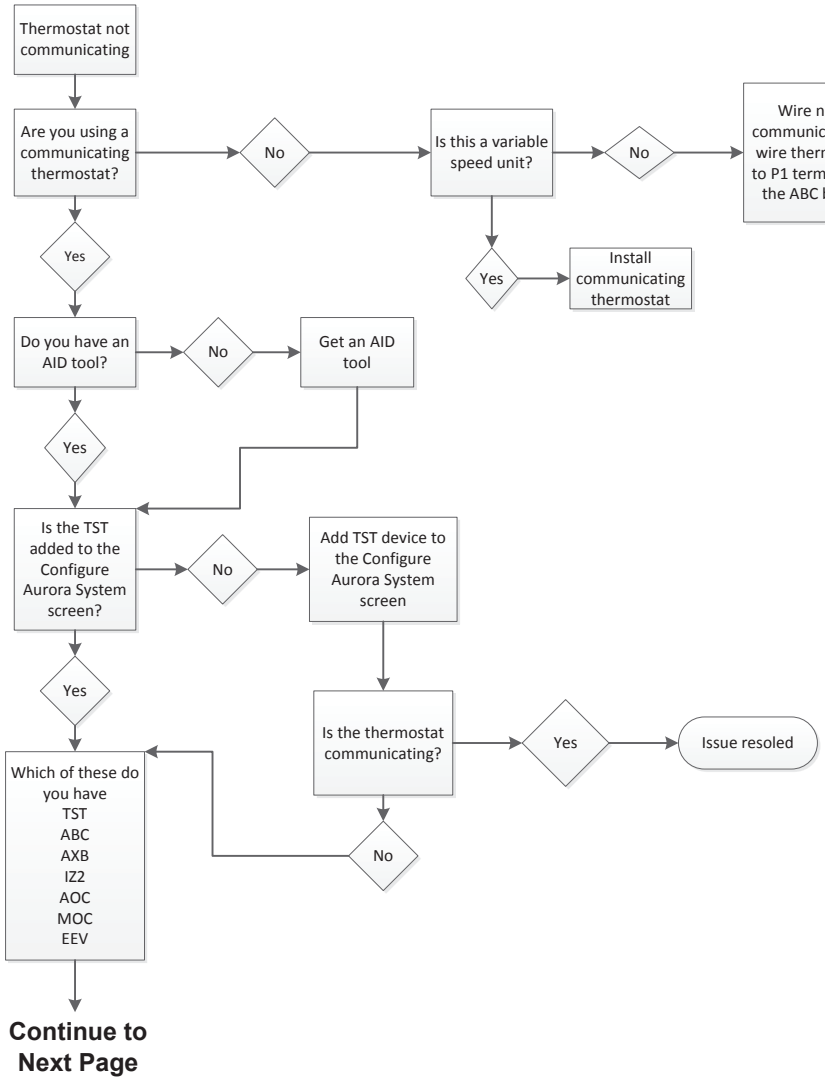
Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.
2. When measuring 240VAC actual value may be between 190 and 250 VAC.

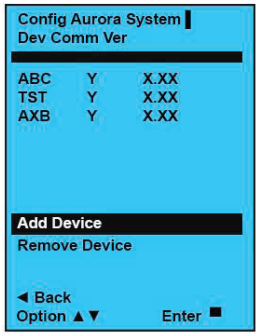




Communicating Thermostat Troubleshooting Guide



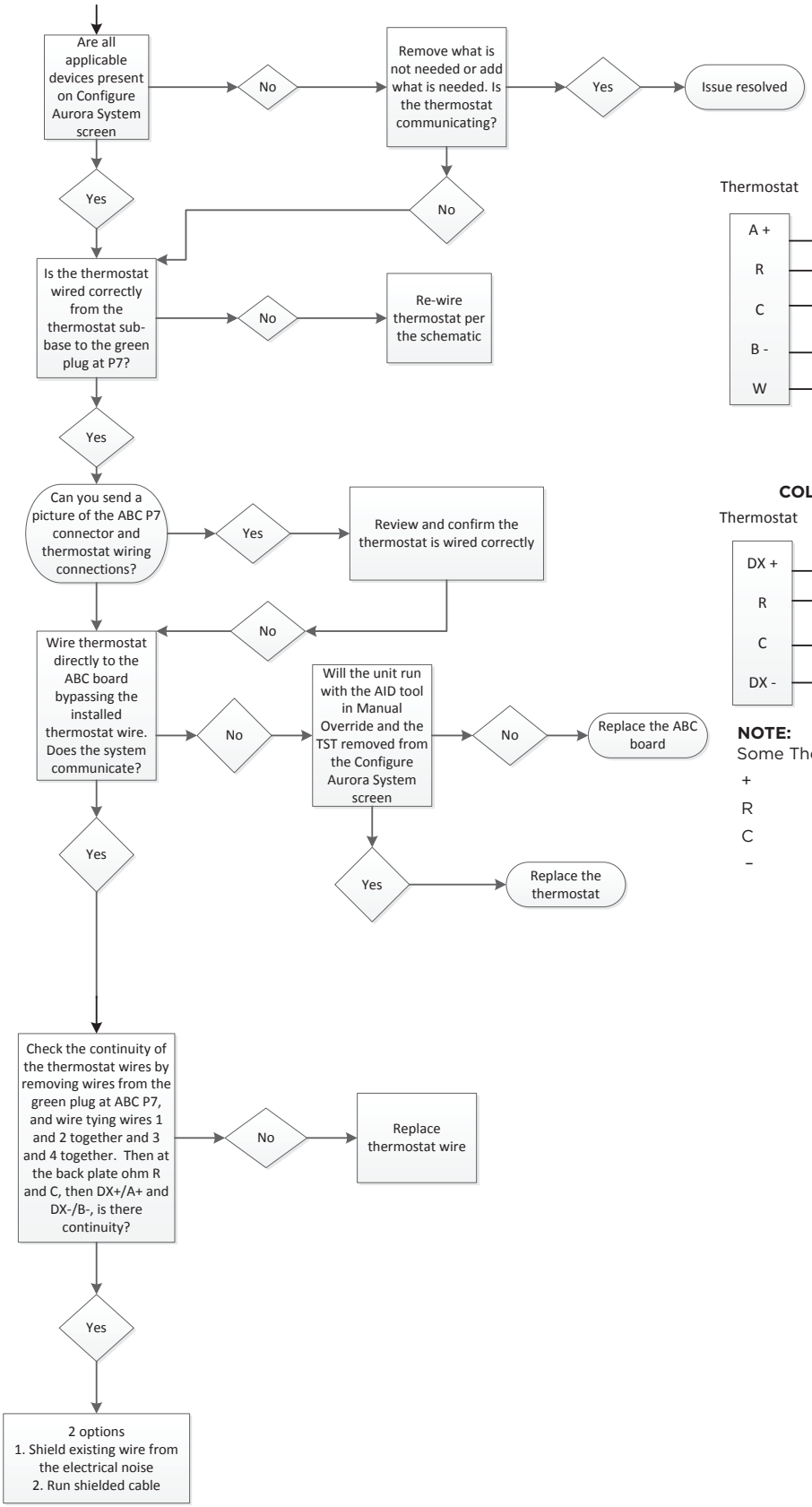
Configure Aurora System Screen



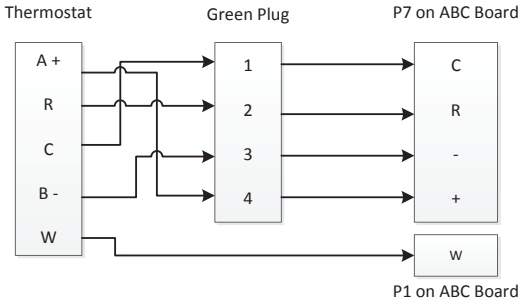
Single and Dual Capacity unit

Y – Active Communication
N – Device has been found, but communication has failed.

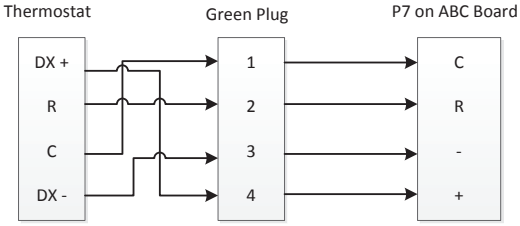
Communicating Thermostat Troubleshooting Guide cont.



TPCM32U03A*/TPCM32U04A*



TPCC SERIES
COLOR TOUCHSCREEN THERMOSTAT

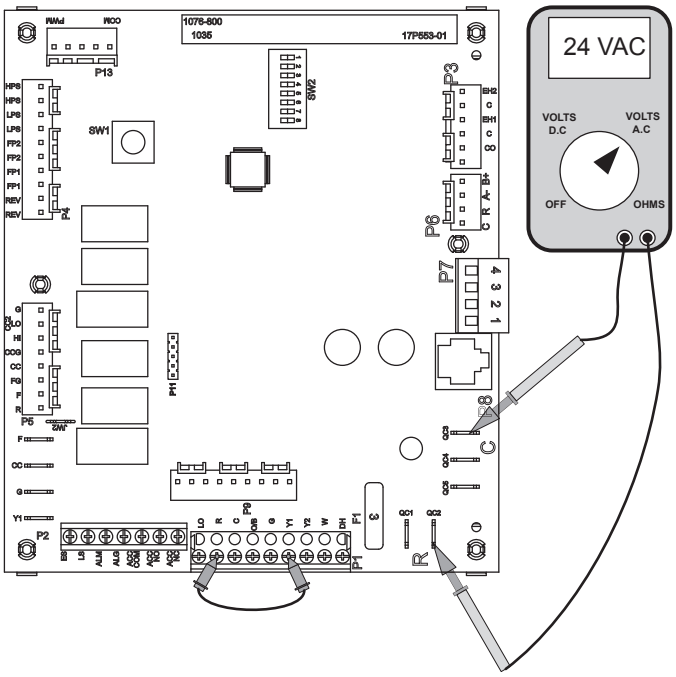


NOTE:
Some Thermostats will be:

\+
R
C
–

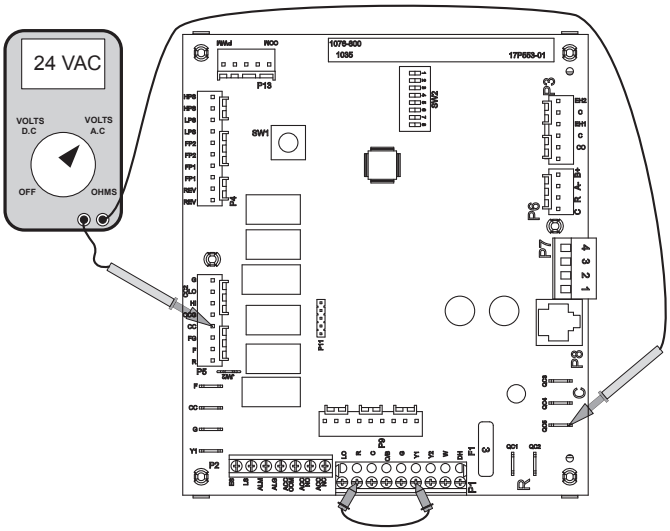
Control Board Signals

To Check for 24VAC between R and C



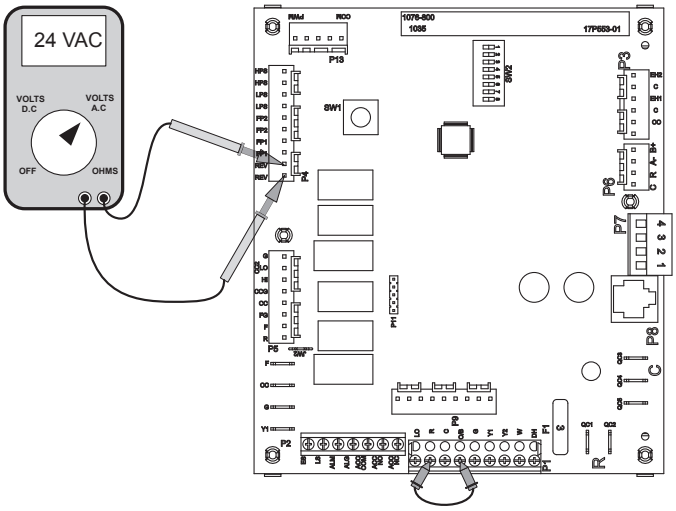
With power applied to the unit connect your Volt meter leads to “R” and “C” on the control board where the yellow and black/white transformer wires connect. The reading should be between 18VAC and 30VAC.

To Check for 24VAC to Compressor Contactor



With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper wire between “R” and “Y1” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. Connect your Volt meter leads to “CC” and “C”. After 1 minute the reading should be between 18 and 30VAC. If you have a signal and the contactor is not pulled in, check voltage across the contactor coil. If you have voltage across the contractor coil, replace the contactor. If there is no voltage across the contactor coil, verify all wiring between the board and contactor. If you have no voltage between CC and C and the fault LED is not flashing, then replace the board.

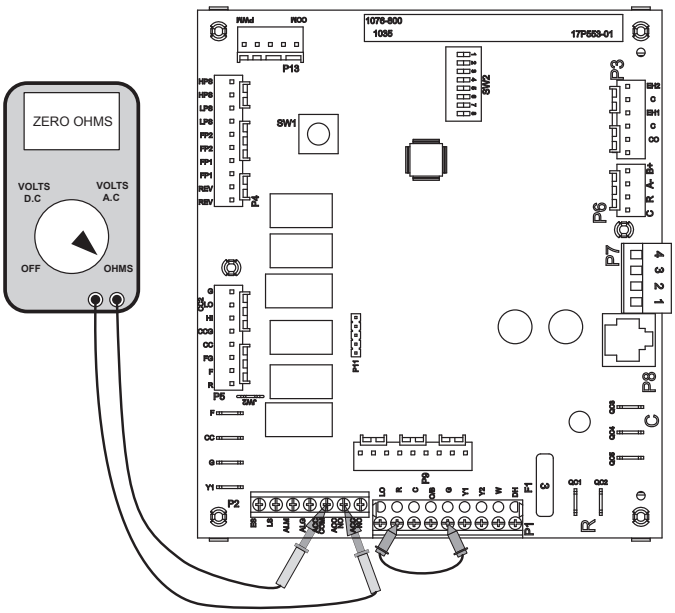
To Check Operation of the Reversing Valve Output



Make sure that SW2-3 is set to “ON”. With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “O” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper wire between “R” and “O” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. Connect your Volt meter leads to the two “REV” pins on P4. The reading should be between 18 and 30VAC. If you have voltage and the reversing valve is not shifting, check voltage across the coil. If you have voltage across the reversing valve coil, but the valve does not shift the reversing valve coil may be bad. If there is no voltage across the coil, verify all wiring between the board and reversing valve. If no voltage is present on the two REV terminals then replace the board.

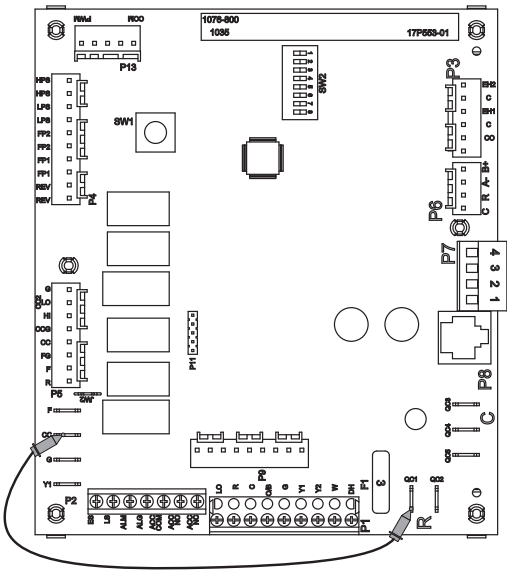
Control Board Signals cont.

To Check Operation of the Accessory Relay



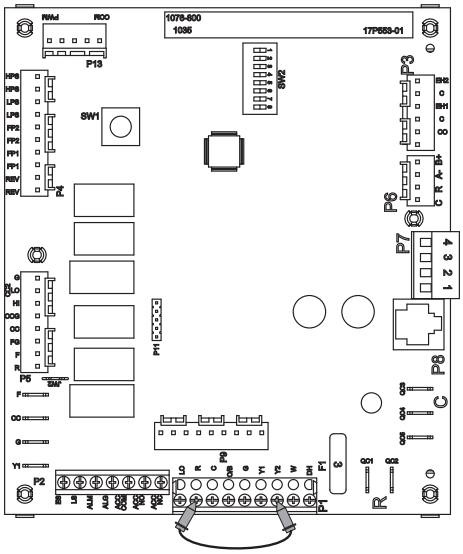
Make sure that SW2-4 and SW2-5 are both set to “ON”. With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “G” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper wire between “R” and “G” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. Connect your Ohm meter leads to the two “ACC COM” and “ACC NO” on P2. A reading of zero ohms indicates that the relay is switching and operating normally. A reading of infinity or open line indicates that the relay did not close and the board should be replaced.

To Bypass the Safety Circuit and Engage the Compressor Contactor



Put gauges on the unit to monitor high/low pressure. Place a jumper between “R” and “CC” as shown. **This will bypass the safety circuit and the compressor will run whether the board is calling for it or not.**

To Check the Freeze Detection Thermistor (AID Tool Required)

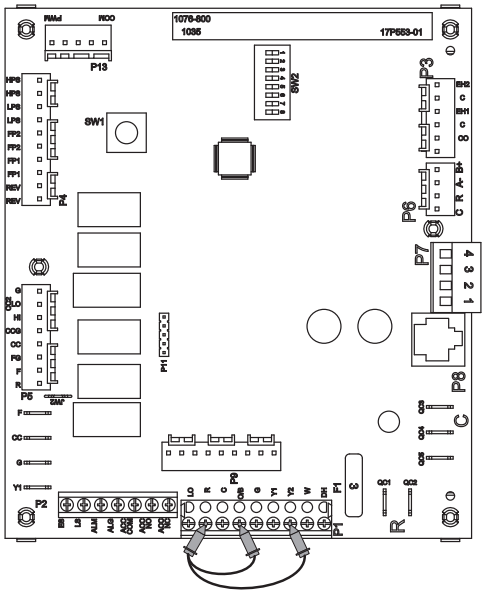


Disconnect the loop pumps so they will not run. Place a thermocouple on the refrigerant line next to the freeze detection thermistor. With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y2” input to ON. If an AID Tool is not available remove the plug on P1 to disconnect the thermostat from the board. Place a jumper on “R” and “Y2” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. As the unit runs in second stage heating with the loop pump(s) not working, the lack of water flow will quickly bring down the temperature of the refrigerant line where the freeze detection thermistor is located. Watch the FP1 temperature reading on the AID Tool and compare it with the thermocouple reading. The thermocouple reading and FP1 reading should be within 2 degrees F of each other. If the thermistor is found to be out of calibration, replace the thermistor. Allowing the unit to continue to run will cause a freeze detection fault to occur. Remember, there is a two minute bypass delay and a 30 second recognition delay on the freeze detection input. This means that the compressor will not shut down during the first 2.5 minutes of run time regardless of how low the freeze thermistor reads.

Other items to check when troubleshooting a freeze detection lockout are superheat, water flow through the coaxial heat exchanger, and antifreeze composition. High superheat in heating will lower the refrigerant line temperature where the freeze protection thermistor is located. In this case, check the expansion device. Closed loop systems are rated at 3 gpm/ton. If a closed loop system is running at less than 3 gpm/ton, the temperature difference between the refrigerant line and the actual leaving water temperature will be greater and could lead to possible freeze detection lockouts.

Control Board Signals cont.

To Check the Condensate Sensor

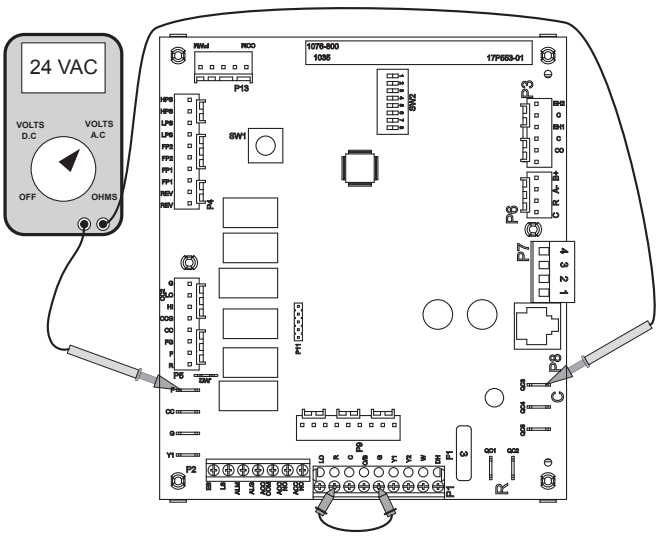


How it works: The condensate sensor is a three part system: a wire, air coil, and water in the drain pan. The wire (spade terminal) and air coil act like a normally open contact and the water acts as the switch. When water in the drain pan fills up and touches the spade terminal, the unit will fault on condensate.

Checking the Sensor: With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “O” and “Y2” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper wire between “R”, “Y2”, and “O” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. Observe the water level in the drain pan. If the unit is locking out on condensate and the drain pan is dry, remove the condensate wire from the drain pan and tape it out of the way. Be careful not to ground the wire out because that will cause the unit to lockout on condensate over flow. If the unit is still locking out, check the brown wire all the way back to the logic board for a short to ground. Remember that the condensate sensor is just a wire looking for a ground. If it touches any metal in the cabinet, the unit will see that as a condensate fault.

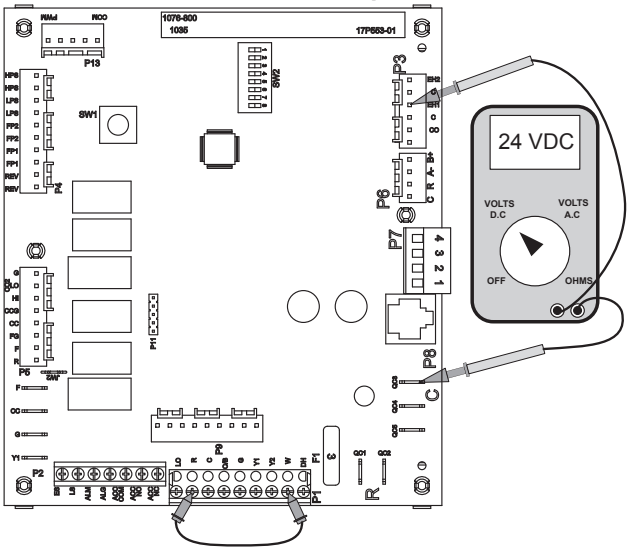
If removing the wire from the drain pan stopped the false drain lockouts, put the condensate sensor back in place in the drain pan. Pay close attention to how far the spade terminal sits down in the drain pan. If the terminal is pushed all the way down so that it is touching the bottom of the drain pan, this will cause a condensate lockout if there is any trace of water in the drain pan. If the spade terminal fits loosely in the drain pan, spread the terminal open to make it fit snugly in the drain pan.

To Check the ECM Blower Motor Enable Signal



With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “G” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper between “R” and “G” as shown. Put the board into test mode by holding SW1 for 2-5 seconds. The blower will come on and run in the “G” speed setting. To check the enable signal to the motor, measure 24VAC between the F and C terminals.

To Check the Electric Heat Outputs



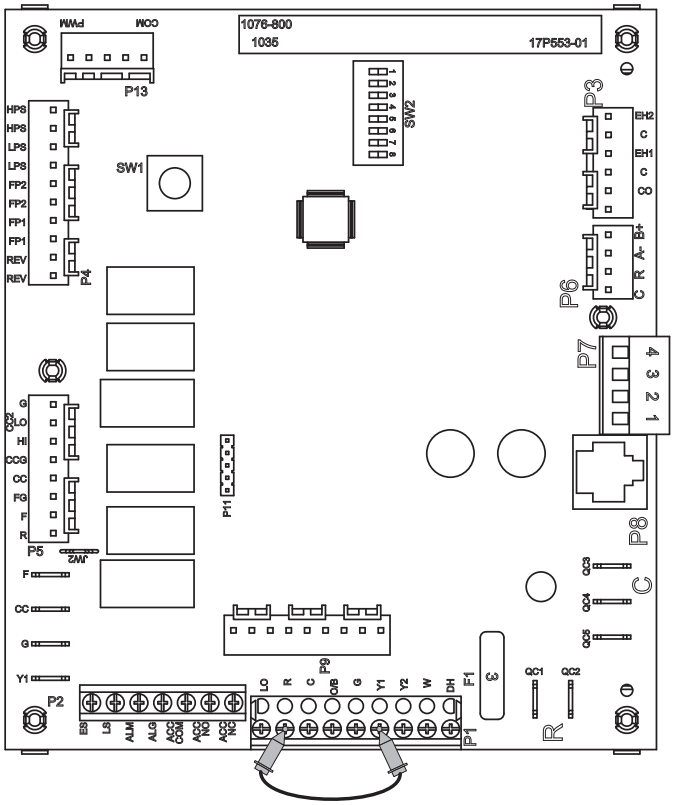
With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “W” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper between “R” and “W” as shown. Put the board into test mode by holding SW1 for 2-5 seconds. The blower will come on and run in high speed. 10 seconds later electric heat output 1 (EH1) will be enabled followed by electric heat output 2 (EH2) in 7.5 seconds. Check EH1 by measuring DC volts between “C” and “EH1” and check EH2 by measuring DC volts between “C” and “EH2”.

Jumping the Control Board

Stage 1 Heating

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the “R” and “Y1” terminals as shown.

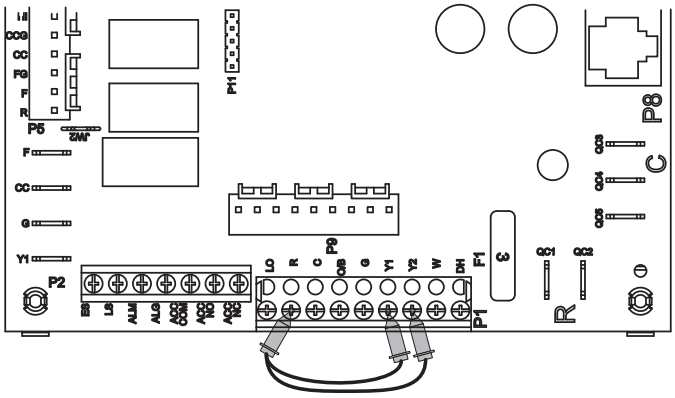
The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input.



Stage 2 Heating

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1” and “Y2” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R, Y1, and Y2 terminals as shown.

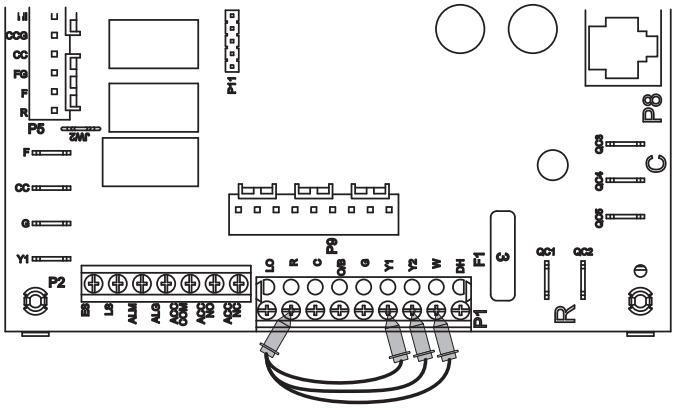
The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input. The compressor will stage to full capacity 20 seconds after the compressor starts, and the blower will change to high speed.



Stage 3 Heating

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1”, “Y2”, and “W” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R, Y1, Y2 and W terminals as shown.

The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input. The compressor will stage to full capacity 20 seconds after the compressor starts, and the blower will change to high speed. The first stage of resistance heat is energized and with continuous third stage demand the second stage of resistance heat will engage in 5 minutes.

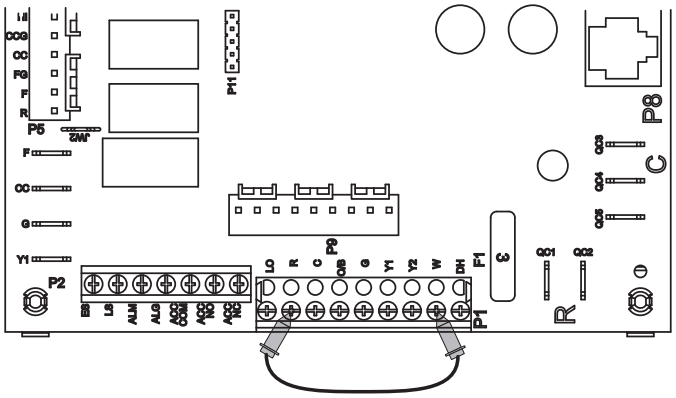


Jumping the Control Board cont.

Emergency Heat

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “W” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the “R” and “W” terminals as shown.

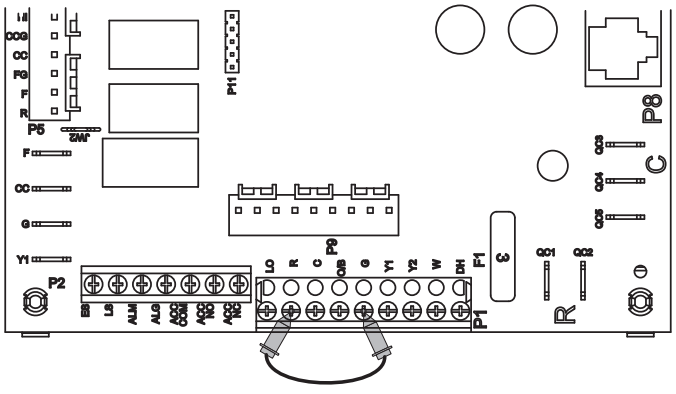
The blower will start on high speed and after 20 seconds the first stage of resistance heat is energized. Continuing demand will engage the second stage after 2 minutes.



Blower Only

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “G” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the “R” and “G” terminals as shown.

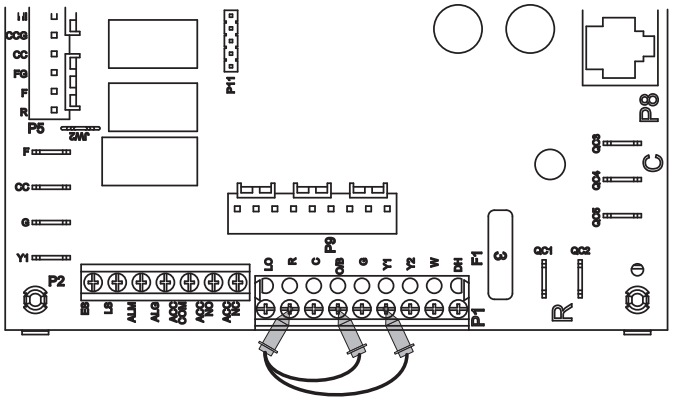
The blower will start on the “G” speed setting. Also, regardless of blower speed setting, the blower will remain on for 30 seconds at the end of each heating, cooling, emergency heat, or reheat cycle.



Stage 1 Cooling

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1” and “O” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R, O, and Y1 terminals as shown.

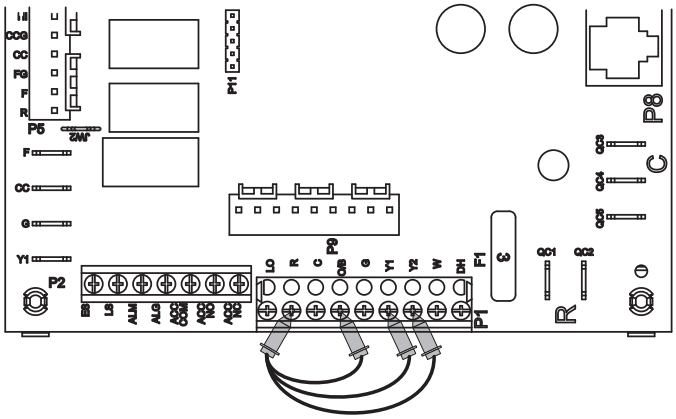
The blower motor will start in “G” blower speed setting immediately, the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input.



Stage 2 Cooling

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1”, “Y2”, and “O” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R, O, Y1, and Y2 terminals as shown.

The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input. The compressor will stage to full capacity 20 seconds after the compressor starts, and the blower will change to high speed.

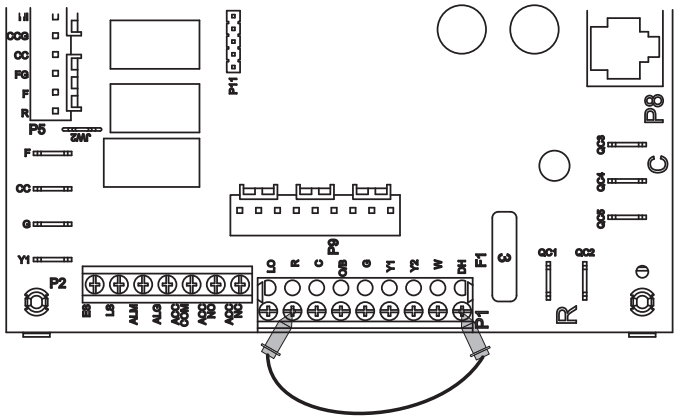


Jumping the Control Board cont.

Reheat Mode

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “DH” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R and DH terminals as shown.

The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the DH input. 20 seconds after the DH input is received the compressor will switch to full capacity and the blower motor will switch to dehumidification high speed. 30 seconds after the compressor starts the alarm/reheat output will energize.



Water Side Analysis: Heat of Extraction/Rejection

By determining the amount of heat extracted or rejected, the service technician can better judge the performance of the unit and verify whether or not the unit performance is acceptable. Use the following formula to find the heat of extraction/rejection.

HEAT OF EXTRACTION/REJECTION

Q=FLOW x FLUID FACTOR x TEMP DIFF
FLOW = gpm
TEMP DIFF = Water Rise or Drop in Fahrenheit degrees across the coax

500 = FLUID FACTOR used for water
485 = FLUID FACTOR used for antifreeze solution

Example: Entering water temperature of 50°F, leaving water temperature 60.1°F, entering water pressure of 40 psi, leaving water pressure of 34.2 psi, entering air temperature of 70°F, and closed loop (485).

ΔP = 40 psi – 34.2 psi
ΔP = 5.8 psi

Convert ΔP to psi using pressure drop table in this manual.
A ΔP of 5.8 psi equals 9 gpm.

Q = 9 gpm x 485 x 10.1°F
Q = 44,087 Btu/hr

Next, find the Heat of Extraction/Rejection Data for the example unit. Match the entering water temperature at 9 gpm. Now, move to the right and read the number under “HR” and compare listed capacity data with actual performance. Note that the example calculation is within 4,800 Btu/hr of the listed HE. Remember to check the Correction Factors tables to adjust for entering air temperature and possibly antifreeze. The actual heat of extraction/rejection should be within 10% of catalog data. If the actual heat of extraction/rejection is less than 90% of catalog data, a further refrigeration check of the unit will be necessary to determine if the unit is charged properly, has a faulty component, or needs adjustment.

Example Unit Data Tables

Pressure Drop

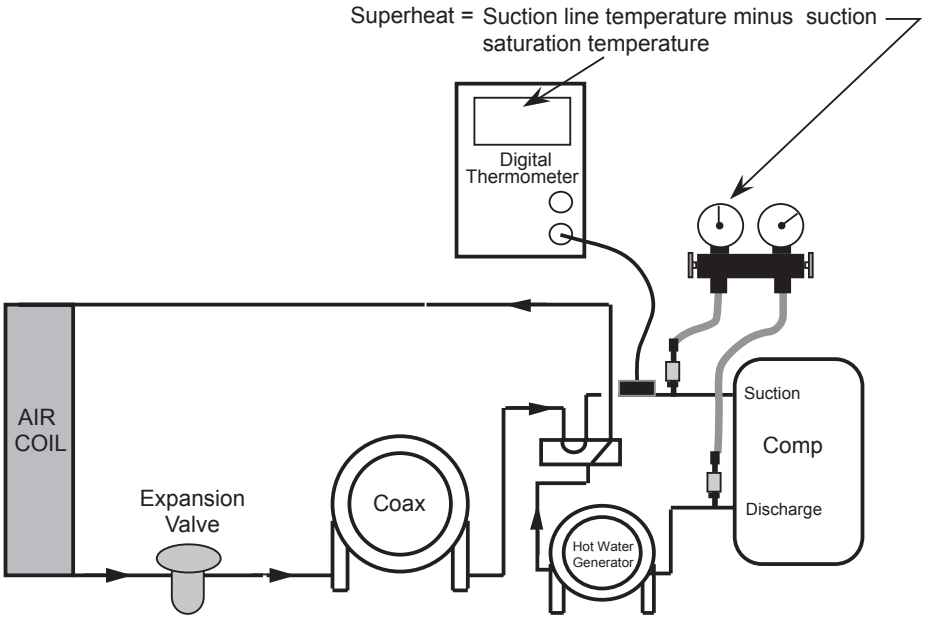
Model	gpm	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
Example	5.0	1.4	1.1	0.9	0.7	0.5
	7.0	2.5	2.3	2.1	1.8	1.6
	9.0	6.0	**5.8**	5.5	5.3	5.1
	12.0	6.6	6.4	6.2	6.0	5.7

Heat of Extraction/Rejection

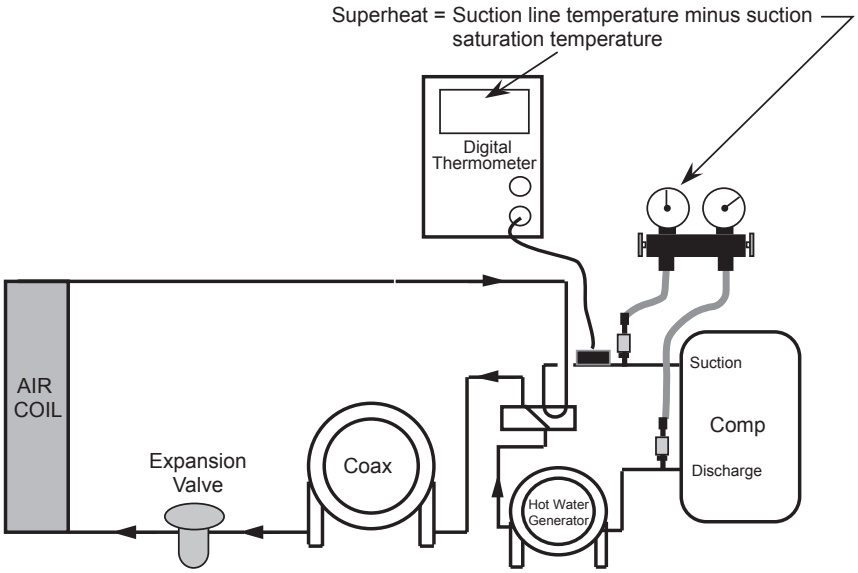
Model	gpm	Heat of Extraction (HE)				Heat of Rejection (HR)				
		30°F	50°F	70°F	90°F	30°F	50°F	70°F	90°F	110°F
Example	5.0		24.6	33.0	41.7		47.4	45.3	44.1	
	7.0	19.0	25.7	34.3	42.4	41.5	47.7	45.8	44.2	42.4
	9.0	19.6	26.8	35.5	43.1	41.7	**48.1**	46.3	44.6	42.7

Superheat/Subcooling

Checking Superheat in the Heating Mode



Checking Superheat in the Cooling Mode



NOTE: Always turn hot water generator off during these tests.

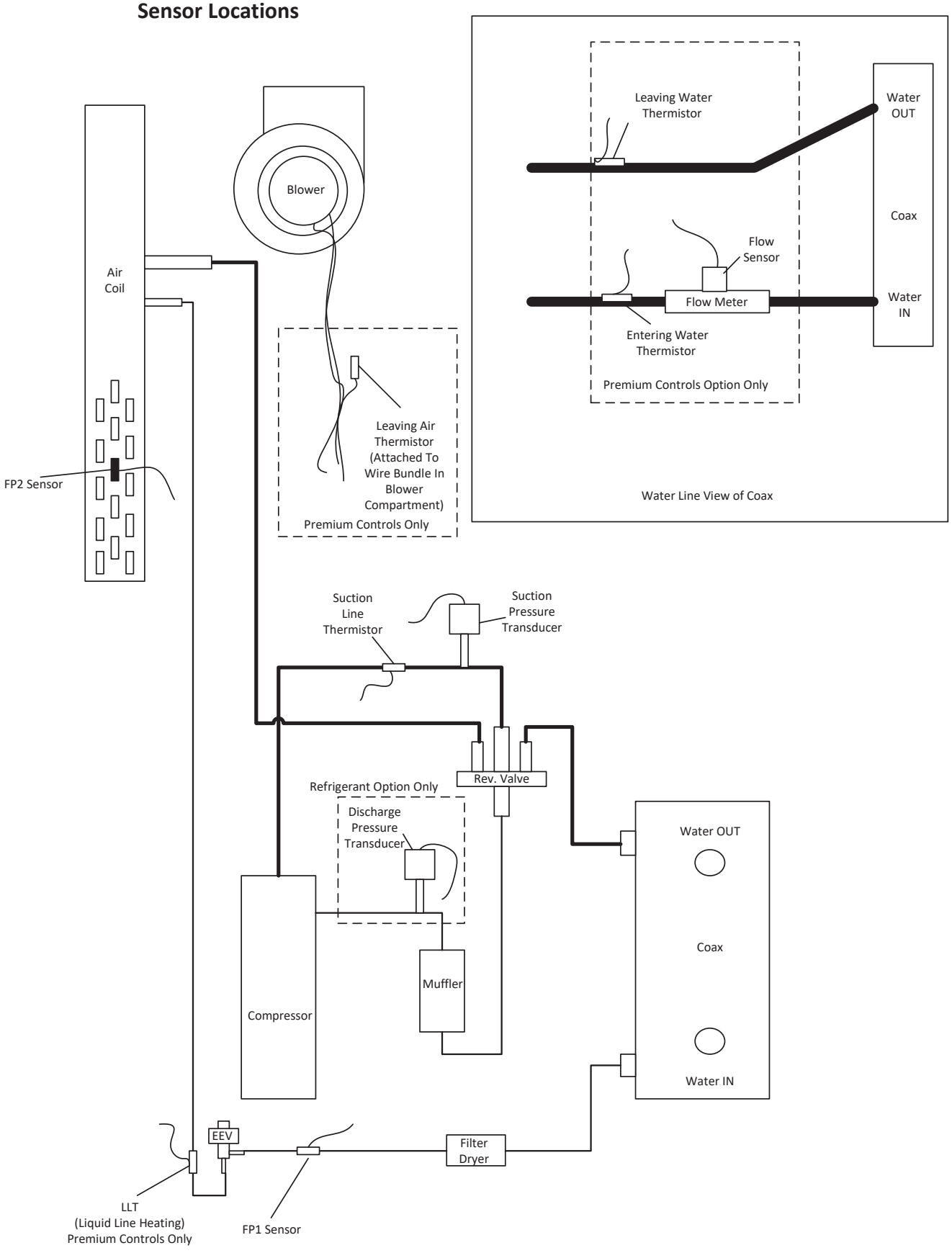
1. Always check water and airflow before putting gages on the unit.
2. Determine superheat and compare with the values shown in the table.
3. If superheat is HIGH, there may be a restriction in the expanion device assembly or low charge. Also check entering air and water temperatures.
4. If superheat is HIGH and subcooling is LOW, the unit may be undercharged.

Entering Water Temperature	Heating		Cooling	
	Superheat	Subcooling	Superheat	Subcooling
030	9-14	5-9	25-35	15-25
050	10-14	5-9	10-18	15-25
070	12-16	5-8	9-14	13-18
090	N/A	N/A	8-13	13-18

Based on nominal 400 cfm per ton airflow and 80°F EAT cooling and 70°F EAT heating. Cooling air and water numbers can vary greatly with changes in humidity.

Troubleshooting

Sensor Locations



Troubleshooting cont.

Startup/Troubleshooting Form

Dealer: _____

Phone #: _____ Date: _____

Problem: _____

Model #: _____

Serial #: _____

Controls Info:

ABC Version: _____

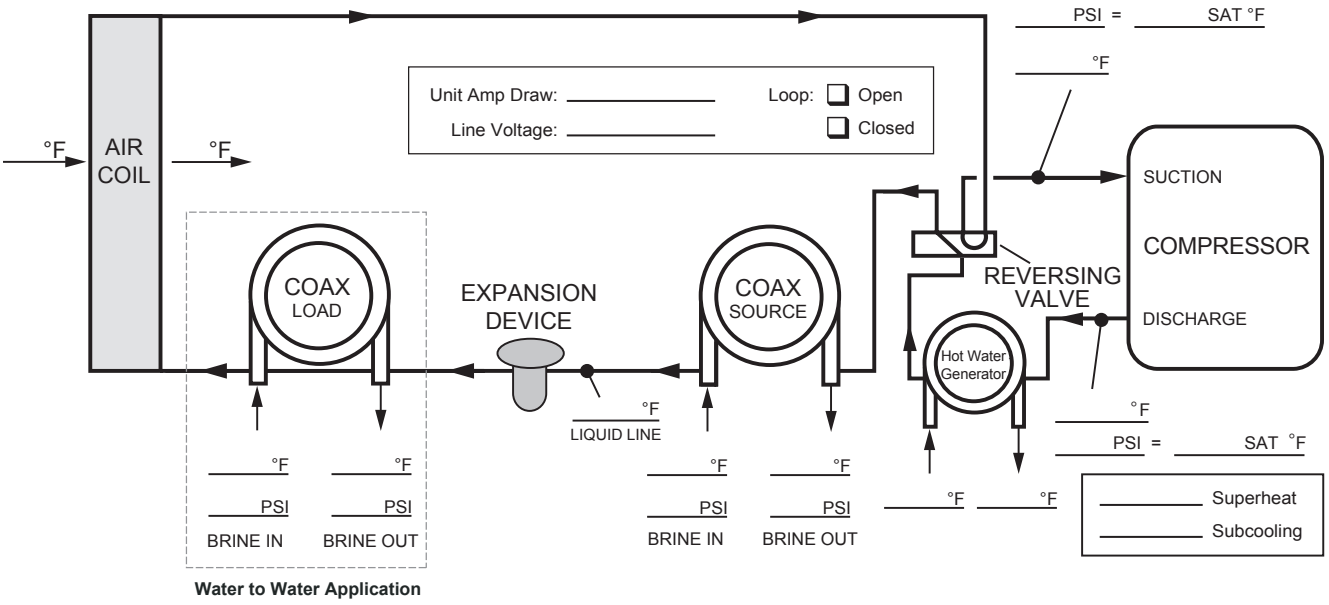
AXB Version: _____

IZ2 Version: _____

T-Stat Version: _____

Installed Sensors: _____

COOLING CYCLE ANALYSIS

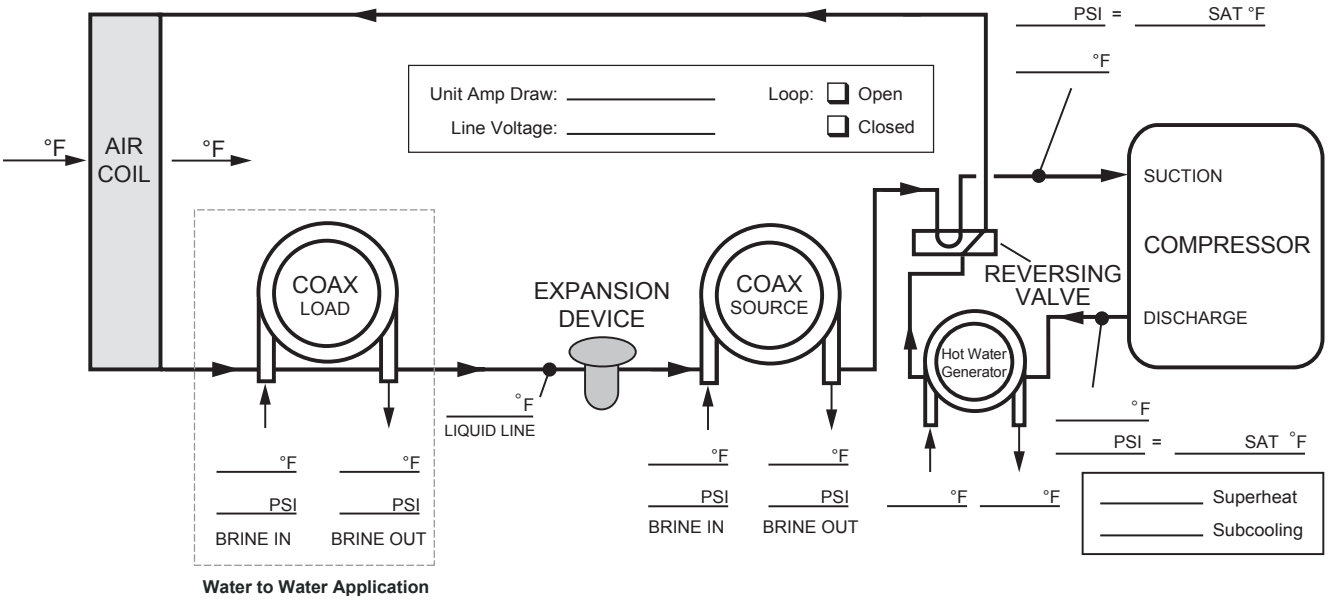


Water to Water Application

Heat of Extraction/Rejection = gpm x 500 (485 for water/antifreeze) x ΔT

Note: DO NOT hook up pressure gauges unless there appears to be a performance problem.

HEATING CYCLE ANALYSIS



Water to Water Application

Troubleshooting cont.

Single Speed/Dual Capacity Startup/Troubleshooting Form

1. Job Information

Model # _____ Job Name: _____ Loop: Open / Closed

Serial # _____ Install Date: _____ Hot Water Generator: Y / N

2. Flow Rate in gpm	**SOURCE COAX**		**LOAD COAX (Water-to-Water)**	
	HEATING	COOLING	HEATING	COOLING
WATER IN Pressure:	a. _____ psi	a. _____ psi	a. _____ psi	a. _____ psi
WATER OUT Pressure:	b. _____ psi	b. _____ psi	b. _____ psi	b. _____ psi
Pressure Drop: a - b	c. _____ psi	c. _____ psi	c. _____ psi	c. _____ psi
Look up flow rate in table:	d. _____ gpm	d. _____ gpm	d. _____ gpm	d. _____ gpm

3. Temp. Rise/Drop Across Coaxial Heat Exchanger[1]			**LOAD COAX (Water-to-Water)**	
	HEATING	COOLING	HEATING	COOLING
WATER IN Temperature:	e. _____ °F	e. _____ °F	h. _____ °F	h. _____ °F
WATER OUT Temperature:	f. _____ °F	f. _____ °F	i. _____ °F	i. _____ °F
Temperature Difference:	g. _____ °F	g. _____ °F	j. _____ °F	j. _____ °F

4. Temp. Rise/Drop Across Air Coil	**SOURCE COAX**	
	HEATING	COOLING
SUPPLY AIR Temperature:	h. _____ °F	h. _____ °F
RETURN AIR Temperature:	i. _____ °F	i. _____ °F
Temperature Difference:	j. _____ °F	j. _____ °F

5. Heat of Rejection (HR)/Heat of Extraction (HE)

Brine Factor[2]: k. _____

	HEATING	COOLING
HR/HE = d x g x k	l. _____ Btu/h	l. _____ Btu/h

STEPS 6-9 NEED ONLY BE COMPLETED IF A PROBLEM IS SUSPECTED.

6. Watts	ENERGY MONITOR	
	HEATING	COOLING
Volts:	m. _____ Volts	m. _____ Volts
Total Amps (Comp. + Blower)[3]:	n. _____ Amps	n. _____ Amps
Watts = m x n x 0.85:	o. _____ Watts	o. _____ Watts

7. Capacity

	HEATING	COOLING
Cooling Capacity = l - (o x 3.413): Heating Capacity = l + (o x 3.413):	p. _____ Btu/h	p. _____ Btu/h

8. Efficiency

	HEATING	COOLING
Cooling EER = p / o: Heating COP = p / (o x 3.413):	q. _____ Btu/h	q. _____ Btu/h

9. Superheat (S.H.)/Subcooling (S.C.)

	HEATING	COOLING
Suction Pressure:	r. _____ psi	r. _____ psi
Suction Saturation Temperature:	s. _____ °F	s. _____ °F
Suction Line Temperature:	t. _____ °F	t. _____ °F
S.H. = t - s	u. _____ °F	u. _____ °F
Head Pressure:	v. _____ psi	v. _____ psi
High Pressure Saturation Temp:	w. _____ °F	w. _____ °F
Liquid Line Temperature[4]:	x. _____ °F	x. _____ °F
S.C. = w - x	y. _____ °F	y. _____ °F

Software Version
ABC: _____
AXB: _____
IZ2: _____
T'STAT: _____

NOTES: [1] Steps 3-9 should be conducted with the hot water generator disconnected.

[2] Use 500 for pure water, 485 for methanol or Environol™. (This constant is derived by multiplying the weight of one gallon of water (8.34) times the minutes in one hour (60) times the specific heat of the fluid. Water has a specific heat of 1.0.

[3] If there is only one source of power for the compressor and blower, amp draw can be measured at the source wiring connection.

[4] Liquid line is between the coax and the expansion device in the cooling mode; between the air coil and the expansion device in the heating mode.

Performance Data

018 - Dual Capacity with Variable Speed ECM High Speed (600 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	3.0	1.9	4.3	Operation not recommended							Operation not recommended							
	4.0	3.4	7.8															
	5.0	4.9	11.4	500	11.5	0.97	8.1	91.2	3.45	1.6								
				600	12.1	1.06	8.5	88.7	3.35	1.5								
30	3.0	1.8	4.2	Operation not recommended							Operation not recommended							
	4.0	3.3	7.6	500	14.2	1.06	10.6	96.3	3.94	1.6	500	20.7	13.5	0.65	0.60	22.7	34.5	-
				600	14.6	1.09	10.9	92.5	3.93	1.6	600	21.0	14.7	0.70	0.63	23.2	33.3	-
	5.0	4.8	11.0	500	14.1	1.01	10.7	96.1	4.09	1.7	500	20.8	13.5	0.65	0.58	22.8	35.8	-
				600	14.9	1.10	11.1	93.0	3.97	1.6	600	21.3	14.7	0.69	0.61	23.4	34.9	-
40	3.0	1.8	4.1	Operation not recommended							Operation not recommended							
	4.0	3.2	7.4	500	16.0	1.10	12.3	99.7	4.26	1.8	500	20.3	13.4	0.66	0.68	22.6	30.1	-
				600	16.5	1.12	12.7	95.5	4.30	1.6	600	20.7	14.7	0.71	0.71	23.1	29.3	-
	5.0	4.6	10.7	500	16.3	1.11	12.5	100.2	4.31	1.8	500	20.5	13.4	0.65	0.66	22.7	31.3	-
				600	16.9	1.14	13.0	96.0	4.35	1.7	600	21.0	14.7	0.70	0.69	23.3	30.6	-
50	3.0	1.7	3.9	500	17.2	1.12	13.4	101.9	4.51	1.9	500	19.0	12.2	0.64	0.79	21.7	24.1	0.9
				600	17.7	1.13	13.8	97.3	4.58	1.7	600	20.0	13.5	0.68	0.83	22.8	24.1	1.0
	4.0	3.1	7.2	500	17.8	1.14	13.9	103.0	4.57	1.9	500	19.4	12.3	0.64	0.74	21.9	26.1	0.8
				600	18.4	1.16	14.4	98.4	4.65	1.8	600	20.4	13.7	0.67	0.78	23.0	26.2	0.9
	5.0	4.5	10.4	500	18.2	1.15	14.3	103.8	4.63	1.9	500	19.6	13.1	0.67	0.72	22.0	27.0	0.8
				600	18.8	1.17	14.8	99.0	4.71	1.9	600	20.6	14.6	0.71	0.76	23.2	27.1	0.9
60	3.0	1.7	3.8	500	19.0	1.15	15.1	105.2	4.82	2.1	500	18.5	12.3	0.66	0.87	21.5	21.2	1.0
				600	19.6	1.16	15.6	100.3	4.94	2.0	600	19.4	13.6	0.70	0.91	22.5	21.3	1.1
	4.0	3.0	6.9	500	19.8	1.19	15.8	106.8	4.90	2.1	500	19.0	12.4	0.65	0.83	21.8	22.9	1.0
				600	20.5	1.19	16.4	101.6	5.03	2.0	600	19.9	13.8	0.69	0.86	22.8	23.0	1.1
	5.0	4.3	10.0	500	20.3	1.20	16.2	107.6	4.97	2.2	500	19.2	13.1	0.68	0.81	21.9	23.7	9.0
				600	21.0	1.21	16.9	102.4	5.11	2.0	600	20.1	14.5	0.72	0.85	23.0	23.8	1.0
70	3.0	1.6	3.7	500	20.8	1.19	16.7	108.5	5.12	2.4	500	18.1	12.4	0.68	0.96	21.4	18.5	1.2
				600	22.3	1.22	18.1	104.4	5.36	2.2	600	19.4	14.3	0.74	0.91	22.5	21.3	1.3
	4.0	2.9	6.7	500	21.9	1.23	17.7	110.5	5.21	2.4	500	18.6	12.5	0.67	0.92	21.7	20.3	1.1
				600	22.6	1.23	18.4	104.9	5.38	2.2	600	19.4	13.9	0.72	0.95	22.6	20.4	1.3
	5.0	4.2	9.7	500	22.4	1.24	18.2	111.5	5.28	2.4	500	18.8	13.0	0.69	0.89	21.8	21.0	1.1
				600	23.2	1.24	19.0	105.8	5.48	2.2	600	19.6	14.4	0.73	0.93	22.8	21.1	1.2
80	3.0	1.5	3.6	500	22.5	1.23	18.3	111.6	5.34	2.7	500	17.6	12.3	0.70	1.08	21.3	16.3	1.6
				600	23.3	1.22	19.1	105.9	5.57	2.5	600	18.3	13.7	0.75	1.11	22.1	16.5	1.7
	4.0	2.8	6.5	500	23.8	1.28	19.4	114.0	5.43	2.7	500	18.1	12.5	0.69	1.04	21.7	17.4	1.5
				600	24.6	1.27	20.3	107.9	5.67	2.4	600	18.8	13.8	0.73	1.07	22.5	17.6	1.6
	5.0	4.1	9.4	500	24.5	1.30	20.0	115.3	5.52	2.7	500	18.3	12.8	0.70	1.02	21.8	18.0	1.4
				600	25.3	1.28	20.9	109.0	5.79	2.5	600	19.1	14.2	0.74	1.05	22.6	18.1	1.5
90	3.0	1.5	3.4	500	24.2	1.28	19.8	114.7	5.55	3.0	500	17.1	12.3	0.72	1.20	21.2	14.3	1.9
				600	25.0	1.26	20.7	108.6	5.83	2.8	600	17.7	13.6	0.77	1.23	21.9	14.4	2.1
	4.0	2.7	6.2	500	25.7	1.33	21.1	117.6	5.64	3.0	500	17.6	12.4	0.71	1.17	21.6	15.1	1.8
				600	26.6	1.31	22.1	111.0	5.95	2.8	600	18.3	13.8	0.75	1.19	22.4	15.3	2.0
	5.0	3.9	9.0	500	26.5	1.35	21.9	119.1	5.74	3.1	500	18.1	13.4	0.74	1.14	22.0	15.9	1.7
				600	27.4	1.32	22.9	112.3	6.08	2.9	600	18.5	13.9	0.75	1.17	22.5	15.8	1.9
100	3.0	1.4	3.3	Operation not recommended							Operation not recommended							
	4.0	2.6	6.0								500	16.6	12.2	0.74	1.32	21.1	12.5	2.2
											600	17.1	13.6	0.79	1.34	21.7	12.7	2.4
	5.0	3.8	8.7								500	16.8	12.2	0.73	1.30	21.2	12.9	2.0
											600	17.3	13.5	0.78	1.32	21.8	13.1	2.3
110	3.0	1.4	3.2								Operation not recommended							
	4.0	2.5	5.8								500	15.5	12.0	0.78	1.48	20.6	10.5	2.9
											600	15.9	13.4	0.84	1.49	21.0	10.7	3.2
	5.0	3.6	8.4								500	15.7	11.9	0.76	1.45	20.6	10.8	2.6
											600	16.1	13.1	0.81	1.47	21.1	11.0	3.0
120	3.0	1.3	3.1								Operation not recommended							
	4.0	2.4	5.6								500	13.4	11.6	0.87	1.66	19.1	8.1	3.5
											600	13.6	12.6	0.92	1.71	19.5	8.0	4.0
	5.0	3.5	8.1								500	13.5	11.6	0.86	1.61	19.0	8.4	3.1
											600	13.8	12.6	0.91	1.66	19.5	8.3	3.5

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Performance Data cont.

018 - Dual Capacity with Variable Speed ECM Low Speed (600 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	2.0	0.9	2.0	Operation not recommended							Operation not recommended							
	3.0	2.0	4.6															
	4.0	3.1	7.3	300	8.0	0.85	5.1	94.6	2.77	1.4								
				400	8.7	0.87	5.7	90.2	2.93	1.3								
30	2.0	0.8	1.9	Operation not recommended							Operation not recommended							
	3.0	1.9	4.5	300	10.3	0.88	7.3	101.8	3.43	1.4	300	15.2	9.7	0.64	0.35	16.5	43.1	-
				400	10.6	0.91	7.5	94.5	3.42	1.4	400	15.5	10.6	0.68	0.37	16.8	41.6	-
	4.0	3.1	7.1	300	9.9	0.89	6.9	100.6	3.26	1.5	300	15.3	9.7	0.63	0.34	16.5	44.7	-
				400	10.8	0.92	7.7	95.0	3.46	1.4	400	15.7	10.6	0.68	0.36	16.9	43.6	-
40	2.0	0.8	1.9	Operation not recommended							Operation not recommended							
	3.0	1.9	4.3	300	11.8	0.91	8.7	106.5	3.83	1.6	300	15.0	9.6	0.64	0.42	16.5	35.9	-
				400	12.2	0.92	9.0	98.2	3.86	1.4	400	15.3	10.5	0.68	0.44	16.8	34.9	-
	4.0	3.0	6.9	300	12.1	0.91	8.9	107.2	3.87	1.6	300	15.2	9.6	0.63	0.41	16.5	37.3	-
				400	12.5	0.93	9.3	98.8	3.91	1.5	400	15.5	10.5	0.67	0.43	17.0	36.5	-
50	2.0	0.8	1.8	300	12.9	0.91	9.8	109.8	4.16	1.7	300	14.1	8.6	0.61	0.51	15.8	27.8	0.7
				400	13.3	0.92	10.1	100.8	4.22	1.5	400	14.8	9.5	0.64	0.53	16.7	27.8	0.8
	3.0	1.8	4.2	300	13.4	0.93	10.2	111.3	4.21	1.7	300	14.4	8.7	0.60	0.48	16.0	30.1	0.6
				400	13.8	0.94	10.6	101.9	4.29	1.6	400	15.1	9.6	0.64	0.50	16.8	30.2	0.7
	4.0	2.9	6.6	300	13.7	0.94	10.5	112.2	4.27	1.7	300	14.5	9.3	0.64	0.47	16.1	31.1	0.6
				400	14.1	0.95	10.9	102.6	4.35	1.7	400	15.3	10.3	0.67	0.49	17.0	31.2	0.7
60	2.0	0.8	1.7	300	14.2	0.93	11.1	114.0	4.51	1.9	300	14.0	8.7	0.62	0.59	16.0	23.8	0.8
				400	14.7	0.93	11.5	104.0	4.63	1.8	400	14.7	9.7	0.66	0.61	16.8	23.9	0.9
	3.0	1.8	4.1	300	14.9	0.95	11.6	115.9	4.59	1.9	300	14.3	8.8	0.61	0.56	16.3	25.7	0.8
				400	15.4	0.96	12.1	105.6	4.70	1.8	400	15.0	9.8	0.65	0.58	17.0	25.8	0.9
	4.0	2.8	6.4	300	15.2	0.96	12.0	117.1	4.65	2.0	300	14.5	9.3	0.64	0.55	16.3	26.6	0.7
				400	15.8	0.97	12.5	106.5	4.78	1.8	400	15.2	10.3	0.68	0.57	17.1	26.7	0.8
70	2.0	0.7	1.7	300	15.6	0.94	12.4	118.2	4.86	2.2	300	13.9	8.8	0.63	0.67	16.2	20.8	1.0
				400	16.4	0.98	13.0	107.9	4.89	2.0	400	14.8	10.2	0.69	0.73	17.2	20.3	1.1
	3.0	1.7	3.9	300	16.4	0.97	13.1	120.6	4.95	2.2	300	14.3	8.9	0.63	0.64	16.5	22.3	0.9
				400	16.9	0.97	13.6	109.2	5.11	2.0	400	14.9	9.9	0.66	0.66	17.3	22.5	1.1
	4.0	2.7	6.2	300	16.8	0.98	13.5	121.9	5.01	2.2	300	14.4	9.3	0.64	0.62	16.6	23.1	0.9
				400	17.4	0.98	14.1	110.3	5.20	2.0	400	15.1	10.3	0.68	0.65	17.4	23.2	1.0
80	2.0	0.7	1.6	300	16.7	0.95	13.5	121.6	5.15	2.5	300	13.1	8.7	0.66	0.78	15.7	16.8	1.4
				400	17.3	0.94	14.1	110.0	5.38	2.3	400	13.6	9.7	0.71	0.80	16.4	16.9	1.5
	3.0	1.6	3.8	300	17.7	0.99	14.3	124.5	5.24	2.5	300	13.4	8.8	0.66	0.75	16.0	17.9	1.3
				400	18.3	0.98	14.9	112.3	5.48	2.3	400	14.0	9.8	0.70	0.78	16.6	18.0	1.4
	4.0	2.6	6.0	300	18.2	1.00	14.8	126.1	5.32	2.2	300	13.6	9.0	0.66	0.74	16.1	18.4	1.3
				400	18.8	0.99	15.4	113.5	5.59	2.5	400	14.2	10.0	0.71	0.76	16.7	18.6	1.7
90	2.0	0.7	1.6	300	17.8	0.96	14.5	125.0	5.45	2.3	300	12.2	8.6	0.70	0.89	15.3	13.7	1.9
				400	18.4	0.94	15.2	112.7	5.73	2.8	400	12.7	9.5	0.75	0.91	15.8	13.9	1.6
	3.0	1.6	3.7	300	18.9	1.00	15.5	128.4	5.54	2.6	300	12.6	8.7	0.69	0.87	15.5	14.5	1.8
				400	19.6	0.98	16.2	115.4	5.84	2.8	400	13.1	9.6	0.74	0.89	16.1	14.7	1.5
	4.0	2.5	5.8	300	19.5	1.02	16.1	130.3	5.63	2.6	300	12.5	9.1	0.73	0.86	15.4	14.5	1.7
				400	20.2	0.99	16.8	116.8	5.97	2.9	400	13.2	9.7	0.73	0.87	16.2	15.2	1.4
100	2.0	0.7	1.5	Operation not recommended							Operation not recommended							
	3.0	1.5	3.5								300	11.7	8.5	0.73	1.01	15.2	11.6	2.0
											400	12.1	9.5	0.78	1.03	15.6	11.8	2.2
	4.0	2.4	5.6								300	11.9	8.5	0.72	0.99	15.3	11.9	1.8
											400	12.3	9.4	0.77	1.01	15.7	12.1	2.1
110	2.0	0.6	1.5								Operation not recommended							
	3.0	1.5	3.4								300	10.9	8.4	0.77	1.16	14.8	9.4	2.7
											400	11.2	9.3	0.83	1.17	15.2	9.6	3.0
	4.0	2.3	5.4								300	11.0	8.2	0.75	1.14	14.9	9.7	2.4
											400	11.3	9.1	0.81	1.15	15.2	9.8	2.8
120	2.0	0.6	1.4								Operation not recommended							
	3.0	1.4	3.3								300	9.9	8.2	0.83	1.32	14.4	7.5	3.3
											400	10.1	8.9	0.88	1.36	14.7	7.4	3.8
	4.0	2.2	5.2								300	10.0	8.2	0.82	1.28	14.4	7.8	2.9
											400	10.2	8.9	0.87	1.32	14.7	7.7	3.3

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Performance Data cont.

024 - Dual Capacity with Variable Speed ECM High Speed (900 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	4.0	1.4	3.2	Operation not recommended							Operation not recommended							
	6.0	3.3	7.6															
	8.0	5.3	12.2	700	16.5	1.46	11.6	91.9	3.32	2.1								
				900	16.8	1.45	11.9	87.3	3.40	2.0								
30	4.0	1.4	3.2	Operation not recommended							Operation not recommended							
	6.0	3.2	7.4	700	18.0	1.47	13.0	93.8	3.59	2.3	700	24.5	15.6	0.64	0.91	27.6	26.8	-
				900	18.5	1.51	13.4	89.1	3.58	2.1	900	24.9	17.0	0.68	0.96	28.2	25.9	-
	8.0	5.1	11.8	700	18.6	1.54	13.3	94.6	3.54	2.3	700	24.6	15.6	0.63	0.89	27.6	27.8	-
				900	18.9	1.53	13.7	89.4	3.62	2.2	900	25.2	17.0	0.67	0.93	28.4	27.1	-
40	4.0	1.3	3.1	Operation not recommended							Operation not recommended							
	6.0	3.1	7.1	700	20.0	1.52	14.8	96.4	3.85	2.5	700	24.9	16.2	0.65	1.02	28.4	24.5	-
				900	20.6	1.55	15.3	91.2	3.89	2.3	900	25.4	17.7	0.70	1.07	29.1	23.8	-
	8.0	5.0	11.5	700	20.4	1.53	15.1	96.9	3.89	2.6	700	25.1	16.2	0.65	0.99	28.5	25.4	-
				900	21.0	1.57	15.7	91.6	3.93	2.4	900	25.7	17.7	0.69	1.04	29.2	24.8	-
50	4.0	1.3	3.0	700	21.1	1.53	15.9	98.0	4.05	2.7	700	24.1	15.3	0.64	1.18	28.2	20.4	1.3
				900	21.8	1.55	16.5	92.4	4.11	2.5	900	25.4	17.1	0.67	1.24	29.6	20.4	1.4
	6.0	3.0	6.9	700	21.9	1.56	16.6	99.0	4.10	2.8	700	24.6	15.5	0.63	1.11	28.4	22.1	1.3
				900	22.6	1.59	17.2	93.3	4.18	2.6	900	25.9	17.2	0.67	1.17	29.9	22.2	1.4
	8.0	4.8	11.1	700	22.4	1.58	17.0	99.6	4.16	2.9	700	24.9	16.6	0.67	1.09	28.6	22.9	1.2
				900	23.1	1.60	17.6	93.8	4.23	2.7	900	26.2	18.4	0.70	1.14	30.1	23.0	1.3
60	4.0	1.2	2.9	700	23.0	1.57	17.7	100.4	4.29	3.1	700	23.7	15.4	0.65	1.30	28.1	18.2	1.6
				900	23.8	1.58	18.4	94.4	4.40	2.9	900	24.8	17.1	0.69	1.36	29.4	18.3	1.7
	6.0	2.9	6.7	700	24.1	1.62	18.5	101.8	4.36	3.2	700	24.2	15.6	0.64	1.24	28.4	19.6	1.5
				900	24.8	1.63	19.3	95.5	4.48	2.9	900	25.4	17.3	0.68	1.29	29.7	19.7	1.6
	8.0	4.7	10.8	700	24.6	1.63	19.1	102.6	4.42	3.3	700	24.4	16.4	0.67	1.21	28.6	20.3	1.4
				900	25.5	1.64	19.9	96.2	4.55	3.0	900	25.7	18.2	0.71	1.26	29.9	20.4	1.6
70	4.0	1.2	2.8	700	24.9	1.61	19.4	103.0	4.53	3.5	700	23.2	15.4	0.67	1.37	27.9	18.5	2.0
				900	23.5	1.62	18.0	94.2	4.25	3.2	900	24.8	17.9	0.72	1.48	29.6	16.8	2.1
	6.0	2.8	6.5	700	26.2	1.67	20.5	104.7	4.61	3.6	700	23.8	15.6	0.66	1.36	28.4	17.5	1.9
				900	27.1	1.67	21.4	97.8	4.76	3.3	900	24.8	17.3	0.70	1.41	29.7	17.6	2.0
	8.0	4.5	10.4	700	26.9	1.69	21.1	105.6	4.67	3.7	700	24.0	16.3	0.68	1.33	28.5	18.1	1.7
				900	27.8	1.68	22.1	98.6	4.85	3.4	900	25.1	18.0	0.72	1.38	29.8	18.2	1.9
80	4.0	1.2	2.7	700	26.6	1.66	20.9	105.2	4.69	3.9	700	22.2	15.2	0.68	1.59	27.6	13.9	2.5
				900	27.5	1.65	21.9	98.3	4.89	3.6	900	23.1	16.9	0.73	1.64	28.7	14.1	2.7
	6.0	2.7	6.3	700	28.1	1.73	22.2	107.2	4.77	4.0	700	22.8	15.4	0.67	1.54	28.0	14.8	2.3
				900	29.1	1.71	23.3	99.9	4.98	3.7	900	23.7	17.0	0.72	1.58	29.1	15.0	2.5
	8.0	4.3	10.0	700	29.0	1.75	23.0	108.3	4.85	4.1	700	23.1	15.7	0.68	1.50	28.2	15.3	2.2
				900	30.0	1.73	24.1	100.8	5.09	3.8	900	24.0	17.5	0.73	1.55	29.3	15.5	2.4
90	4.0	1.1	2.6	700	28.3	1.71	22.5	107.4	4.85	4.3	700	21.2	14.9	0.70	1.76	27.2	12.0	3.1
				900	29.3	1.69	23.6	100.2	5.09	4.0	900	22.0	16.6	0.76	1.81	28.1	12.2	3.3
	6.0	2.6	6.0	700	30.1	1.79	24.0	109.8	4.93	4.5	700	21.8	15.1	0.69	1.71	27.7	12.7	2.9
				900	31.2	1.76	25.2	102.0	5.20	4.1	900	22.6	16.8	0.74	1.76	28.6	12.9	3.2
	8.0	4.2	9.7	700	31.0	1.82	24.8	111.0	5.01	4.6	700	22.0	15.3	0.70	1.62	27.5	13.6	2.7
				900	32.1	1.77	26.1	103.0	5.32	4.3	900	22.9	16.9	0.74	1.72	28.8	13.3	3.0
100	4.0	1.1	2.5	Operation not recommended							Operation not recommended							
	6.0	2.5	5.8								700	20.6	14.6	0.71	1.94	27.2	10.6	3.6
											900	21.3	16.2	0.76	1.97	28.0	10.8	3.9
	8.0	4.0	9.3								700	20.8	14.6	0.70	1.91	27.3	10.9	3.3
											900	21.5	16.2	0.75	1.94	28.1	11.1	3.7
110	4.0	1.0	2.4								Operation not recommended							
	6.0	2.4	5.6								700	19.4	14.1	0.73	2.18	26.8	8.9	4.4
											900	19.9	15.7	0.79	2.19	27.4	9.1	4.7
	8.0	3.9	9.0								700	19.6	14.0	0.71	2.14	26.9	9.2	4.1
											900	20.1	15.4	0.77	2.16	27.5	9.3	4.5
120	4.0	1.0	2.3								Operation not recommended							
	6.0	2.3	5.4								700	18.1	13.5	0.75	2.43	26.5	7.5	5.3
											900	18.5	14.7	0.80	2.50	27.0	7.4	5.7
	8.0	3.7	8.6								700	18.3	13.5	0.74	2.36	26.3	7.8	4.9
											900	18.7	14.7	0.79	2.43	27.0	7.7	5.4

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Performance Data cont.

024 - Dual Capacity with Variable Speed ECM Low Speed (700 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	3.0	0.9	2.0	Operation not recommended							Operation not recommended							
	5.0	2.5	5.7															
	7.0	4.1	9.5	500	11.2	1.07	7.6	90.8	3.09	1.8								
				700	11.5	1.05	7.9	85.2	3.21	1.6								
30	3.0	0.8	1.9	Operation not recommended							Operation not recommended							
	5.0	2.4	5.5	500	13.0	1.11	9.2	94.0	3.41	1.8	500	18.5	11.9	0.64	0.53	20.3	34.8	-
				700	13.3	1.15	9.4	87.6	3.40	1.6	700	18.8	13.0	0.69	0.56	20.7	33.6	-
	7.0	4.0	9.2	500	13.3	1.18	9.3	94.6	3.30	1.8	500	18.5	11.9	0.64	0.51	20.3	36.1	-
				700	13.6	1.16	9.6	88.0	3.44	1.6	700	19.0	13.0	0.68	0.54	20.8	35.2	-
40	3.0	0.8	1.9	Operation not recommended							Operation not recommended							
	5.0	2.3	5.3	500	14.4	1.13	10.6	96.7	3.75	1.8	500	18.6	12.2	0.66	0.62	20.7	30.2	-
				700	14.8	1.15	10.9	89.6	3.78	1.7	700	18.9	13.4	0.71	0.65	21.1	29.3	-
	7.0	3.9	8.9	500	14.7	1.14	10.8	97.2	3.79	1.9	500	18.7	12.2	0.65	0.60	20.8	31.3	-
				700	15.2	1.16	11.2	90.0	3.83	1.7	700	19.2	13.4	0.70	0.63	21.3	30.6	-
50	3.0	0.8	1.8	500	15.3	1.11	11.5	98.3	4.04	1.9	500	17.8	11.4	0.64	0.74	20.3	24.2	0.7
				700	15.7	1.12	11.9	90.8	4.10	1.7	700	18.7	12.7	0.68	0.77	21.3	24.2	0.8
	5.0	2.2	5.2	500	15.8	1.13	12.0	99.3	4.09	1.9	500	18.2	11.6	0.64	0.69	20.5	26.2	0.7
				700	16.3	1.15	12.4	91.6	4.17	1.8	700	19.1	12.8	0.67	0.73	21.6	26.3	0.7
	7.0	3.7	8.6	500	16.2	1.14	12.3	100.0	4.15	2.0	500	18.3	12.3	0.67	0.68	20.6	27.1	0.6
				700	16.7	1.16	12.7	92.1	4.22	1.8	700	19.3	13.7	0.71	0.71	21.7	27.2	0.7
60	3.0	0.8	1.8	500	16.6	1.12	12.8	100.8	4.37	2.1	500	17.2	11.4	0.66	0.85	20.1	20.2	1.0
				700	17.2	1.12	13.3	92.7	4.48	1.9	700	18.1	12.7	0.70	0.89	21.1	20.3	1.0
	5.0	2.2	5.0	500	17.4	1.15	13.5	102.2	4.44	2.0	500	17.7	11.5	0.65	0.81	20.4	21.8	0.9
				700	18.0	1.16	14.0	93.7	4.55	2.2	700	18.5	12.8	0.69	0.84	21.4	21.9	1.0
	7.0	3.6	8.4	500	17.8	1.16	13.9	103.0	4.50	2.0	500	17.8	12.2	0.68	0.79	20.5	22.6	0.8
				700	18.4	1.17	14.4	94.3	4.63	2.3	700	18.7	13.5	0.72	0.83	21.5	22.7	0.9
70	3.0	0.7	1.7	500	18.0	1.12	14.2	103.4	4.70	2.1	500	16.7	11.4	0.68	0.97	20.0	17.3	1.3
				700	20.2	1.70	15.4	109.9	5.21	2.4	700	18.0	13.2	0.73	1.05	21.2	17.1	1.4
	5.0	2.1	4.9	500	19.0	1.16	15.0	105.1	4.79	2.2	500	17.1	11.5	0.67	0.93	20.3	18.5	1.3
				700	19.6	1.16	15.6	95.9	4.94	2.4	700	17.9	12.8	0.72	0.96	21.3	18.7	1.2
	7.0	3.5	8.1	500	19.0	1.16	15.0	105.2	4.80	2.2	500	17.3	12.0	0.69	0.90	20.4	19.2	1.3
				700	20.1	1.17	16.1	96.6	5.04	2.6	700	18.1	13.3	0.73	0.94	21.6	19.3	1.8
80	3.0	0.7	1.7	500	19.3	1.13	15.5	105.8	5.00	2.4	500	16.0	11.4	0.71	1.11	19.8	14.3	1.9
				700	20.0	1.12	16.2	96.5	5.22	2.6	700	16.6	12.6	0.76	1.15	20.5	14.4	1.7
	5.0	2.0	4.7	500	20.4	1.18	16.4	107.9	5.09	2.4	500	16.4	11.5	0.70	1.08	20.1	15.2	1.9
				700	21.1	1.17	17.2	98.0	5.31	2.7	700	17.1	12.7	0.75	1.11	20.8	15.4	1.6
	7.0	3.4	7.8	500	21.0	1.19	17.0	108.9	5.17	2.6	500	16.6	11.8	0.71	1.05	20.2	15.7	1.8
				700	21.8	1.18	17.7	98.8	5.43	2.5	700	17.3	13.1	0.76	1.09	21.0	15.9	2.4
90	3.0	0.7	1.6	500	20.6	1.14	16.7	108.2	5.30	2.9	500	15.2	11.3	0.74	1.26	19.5	12.0	2.6
				700	21.4	1.12	17.5	98.3	5.57	2.7	700	15.7	12.6	0.80	1.29	20.1	12.2	2.3
	5.0	2.0	4.5	500	21.9	1.19	17.9	110.6	5.39	3.0	500	15.6	11.5	0.73	1.22	19.8	12.8	2.5
				700	22.7	1.17	18.7	100.0	5.68	2.8	700	16.2	12.7	0.78	1.26	20.5	12.9	2.1
	7.0	3.3	7.5	500	22.6	1.21	18.5	111.9	5.48	3.1	500	15.6	11.0	0.71	1.18	19.6	13.2	2.4
				700	23.4	1.18	19.4	101.0	5.81	2.8	700	16.4	12.8	0.78	1.23	20.6	13.3	3.1
100	3.0	0.7	1.5	Operation not recommended							Operation not recommended							
	5.0	1.9	4.4								500	14.9	11.1	0.75	1.41	19.7	10.5	3.0
											700	15.3	12.3	0.80	1.43	20.2	10.7	3.2
	7.0	3.1	7.3								500	15.0	11.1	0.74	1.39	19.7	10.8	2.8
											700	15.5	12.3	0.79	1.41	20.3	11.0	3.1
110	3.0	0.6	1.5								Operation not recommended							
	5.0	1.8	4.2								500	14.1	10.7	0.76	1.60	19.5	8.8	3.8
											700	14.5	11.9	0.83	1.61	20.0	9.0	4.1
	7.0	3.0	7.0								500	14.2	10.6	0.75	1.57	19.6	9.0	3.5
											700	14.6	11.7	0.80	1.59	20.1	9.2	3.9
120	3.0	0.6	1.4								Operation not recommended							
	5.0	1.7	4.0								500	12.7	10.0	0.79	1.80	18.9	7.0	4.7
											700	12.9	10.9	0.84	1.85	19.3	7.0	5.1
	7.0	2.9	6.7								500	12.8	10.0	0.78	1.75	18.8	7.4	4.3
											700	13.1	10.9	0.83	1.80	19.2	7.3	4.8

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Performance Data cont.

030 - Dual Capacity with Variable Speed ECM High Speed (900 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	6.0	2.7	6.2	Operation not recommended							Operation not recommended							
	7.0	3.5	8.1															
	8.0	4.3	10.0	850	20.6	1.92	14.1	92.5	3.15	2.2								
				1000	21.3	1.90	14.8	89.7	3.29	2.0								
30	6.0	2.6	6.0	Operation not recommended							Operation not recommended							
	7.0	3.4	7.9	850	23.9	1.88	17.5	96.1	3.72	2.4	850	34.4	23.2	0.67	1.07	38.0	32.1	-
				1000	24.6	1.94	18.0	92.8	3.72	2.2	1000	34.9	25.3	0.72	1.13	38.8	31.0	-
	8.0	4.2	9.7	850	24.3	1.98	17.5	96.5	3.60	2.4	850	34.6	23.2	0.67	1.04	38.1	33.3	-
				1000	25.1	1.96	18.4	93.2	3.75	2.2	1000	35.4	25.3	0.71	1.09	39.1	32.5	-
40	6.0	2.5	5.9	Operation not recommended							Operation not recommended							
	7.0	3.3	7.6	850	27.3	1.97	20.6	99.8	4.06	2.6	850	35.3	23.6	0.67	1.19	39.4	29.6	-
				1000	28.2	2.02	21.3	96.1	4.09	2.4	1000	36.0	25.8	0.72	1.25	40.3	28.8	-
	8.0	4.1	9.4	850	27.9	1.99	21.1	100.4	4.10	2.7	850	35.6	23.6	0.66	1.16	39.6	30.8	-
				1000	28.8	2.04	21.8	96.6	4.14	2.5	1000	36.4	25.8	0.71	1.21	40.5	30.1	-
50	6.0	2.5	5.7	850	29.6	2.02	22.8	102.3	4.31	2.8	850	34.4	21.8	0.63	1.38	39.1	25.0	1.4
				1000	30.5	2.05	23.6	98.3	4.37	2.6	1000	36.2	24.3	0.67	1.45	41.2	25.0	1.5
	7.0	3.2	7.4	850	30.7	2.06	23.7	103.5	4.36	2.9	850	35.2	22.1	0.63	1.30	39.6	27.1	1.3
				1000	31.7	2.09	24.6	99.4	4.44	2.7	1000	37.0	24.5	0.66	1.36	41.6	27.2	1.4
	8.0	4.0	9.1	850	31.4	2.08	24.3	104.2	4.42	3.0	850	35.5	23.6	0.66	1.27	39.8	28.0	1.2
				1000	32.4	2.11	25.2	100.0	4.50	2.8	1000	37.4	26.2	0.70	1.33	41.9	28.1	1.4
60	6.0	2.4	5.5	850	33.2	2.11	26.0	106.2	4.62	3.2	850	33.1	21.6	0.65	1.53	38.4	21.7	1.7
				1000	34.3	2.12	27.1	101.8	4.74	3.0	1000	34.8	24.1	0.69	1.60	40.2	21.8	1.8
	7.0	3.1	7.2	850	34.7	2.17	27.3	107.8	4.70	3.3	850	33.9	21.9	0.65	1.45	38.9	23.4	1.6
				1000	35.9	2.18	28.4	103.2	4.82	3.0	1000	35.5	24.3	0.68	1.51	40.7	23.5	1.7
	8.0	3.8	8.8	850	35.6	2.19	28.1	108.8	4.76	3.4	850	34.3	23.1	0.67	1.42	39.1	24.2	1.5
				1000	36.8	2.20	29.2	104.0	4.90	3.1	1000	36.0	25.6	0.71	1.48	41.0	24.3	1.6
70	6.0	2.3	5.3	850	36.9	2.20	29.4	110.1	4.91	3.6	850	31.9	21.4	0.67	1.68	37.6	18.5	2.1
				1000	40.5	2.26	32.3	107.5	5.25	3.3	1000	37.4	24.8	0.66	1.67	39.8	22.4	2.2
	7.0	3.0	6.9	850	38.8	2.27	31.0	112.2	5.00	3.7	850	32.7	21.7	0.66	1.61	38.2	20.4	2.0
				1000	40.0	2.27	32.8	107.1	5.16	3.4	1000	34.1	24.0	0.71	1.66	40.1	20.5	2.1
	8.0	3.7	8.6	850	39.7	2.30	31.9	113.3	5.07	3.8	850	33.0	22.6	0.68	1.57	38.4	21.1	1.8
				1000	41.1	2.29	33.3	108.1	5.26	3.5	1000	34.5	25.0	0.72	1.63	43.1	21.2	2.0
80	6.0	2.2	5.1	850	41.1	2.33	33.1	114.7	5.16	4.0	850	30.5	21.2	0.69	1.86	36.9	16.4	2.6
				1000	42.5	2.31	34.6	109.3	5.38	3.7	1000	31.7	23.6	0.74	1.92	38.3	16.5	2.8
	7.0	2.9	6.7	850	43.4	2.42	35.1	117.3	5.25	4.1	850	31.4	21.4	0.68	1.80	37.5	17.4	2.5
				1000	44.9	2.40	36.7	111.6	5.48	3.8	1000	32.6	23.8	0.73	1.85	38.9	17.6	2.7
	8.0	3.6	8.3	850	44.7	2.46	36.3	118.7	5.33	4.3	850	31.7	22.0	0.69	1.76	37.7	18.0	2.3
				1000	46.2	2.42	37.9	112.8	5.60	3.9	1000	33.0	24.4	0.74	1.82	39.2	18.2	2.5
90	6.0	2.1	5.0	850	45.2	2.47	36.8	119.3	5.37	4.5	850	29.2	20.9	0.72	2.05	36.2	14.2	3.3
				1000	46.8	2.43	38.6	113.4	5.65	4.2	1000	30.2	23.3	0.77	2.10	37.4	14.4	3.5
	7.0	2.8	6.5	850	48.1	2.58	39.3	122.4	5.47	4.6	850	30.0	21.2	0.71	1.99	36.8	15.1	3.1
				1000	49.8	2.53	41.1	116.1	5.76	4.3	1000	31.2	23.5	0.75	2.04	38.1	15.3	3.3
	8.0	3.4	8.0	850	49.6	2.61	40.7	124.0	5.56	4.8	850	30.9	21.9	0.71	1.95	37.6	15.8	2.8
				1000	51.3	2.55	42.6	117.5	5.90	4.4	1000	31.5	23.7	0.75	2.00	38.3	15.8	3.2
100	6.0	2.1	4.8	Operation not recommended							Operation not recommended							
	7.0	2.7	6.2								850	28.7	20.8	0.72	2.25	36.4	12.8	3.8
											1000	29.7	23.1	0.78	2.28	37.5	13.0	4.1
	8.0	3.3	7.7								850	29.1	20.8	0.72	2.21	36.6	13.1	3.5
											1000	30.0	23.0	0.77	2.25	37.7	13.4	3.9
110	6.0	2.0	4.6								Operation not recommended							
	7.0	2.6	6.0								850	27.5	20.5	0.75	2.51	36.0	11.0	4.6
											1000	28.2	22.8	0.81	2.53	36.8	11.2	5.0
	8.0	3.2	7.4								850	27.7	20.2	0.73	2.46	36.2	11.3	4.3
											1000	28.5	22.3	0.78	2.49	37.0	11.4	4.7
120	6.0	1.9	4.4								Operation not recommended							
	7.0	2.5	5.8								850	27.0	20.4	0.75	2.80	36.5	9.7	5.5
											1000	27.5	22.1	0.80	2.87	37.3	9.6	6.0
	8.0	3.1	7.1								850	27.2	20.4	0.75	2.70	36.4	10.1	5.1
											1000	27.8	22.1	0.79	2.79	37.3	10.0	5.5

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Performance Data cont.

030 - Dual Capacity with Variable Speed ECM Low Speed (900 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	5.0	2.0	4.6	Operation not recommended							Operation not recommended							
	6.0	2.8	6.5															
	7.0	3.5	8.0	600	14.2	1.49	9.2	92.0	2.80	1.9								
				800	14.5	1.42	9.7	86.8	2.99	1.7								
30	5.0	1.9	4.5	Operation not recommended							Operation not recommended							
	6.0	2.7	6.3	600	16.0	1.39	11.3	94.7	3.37	2.1	600	24.5	17.0	0.70	0.58	26.5	42.2	-
				800	16.5	1.44	11.6	89.1	3.36	1.9	800	24.9	18.6	0.75	0.61	27.0	40.7	-
	7.0	3.4	7.8	600	16.5	1.52	11.3	95.5	3.18	2.1	600	24.6	17.0	0.69	0.56	26.5	43.8	-
				800	16.8	1.45	11.9	89.4	3.40	1.9	800	25.2	18.6	0.74	0.59	27.2	42.7	-
40	5.0	1.9	4.3	Operation not recommended							Operation not recommended							
	6.0	2.6	6.1	600	19.0	1.42	14.2	99.3	3.92	2.3	600	26.0	17.7	0.68	0.66	28.2	39.3	-
				800	19.6	1.45	14.6	92.7	3.96	2.1	800	26.4	19.3	0.73	0.69	28.8	38.2	-
	7.0	3.3	7.5	600	19.4	1.43	14.5	99.9	3.96	2.4	600	26.2	17.7	0.68	0.64	28.4	40.8	-
				800	20.0	1.47	15.0	93.1	4.00	2.2	800	26.8	19.3	0.72	0.67	29.0	39.9	-
50	5.0	1.8	4.2	600	21.2	1.42	16.4	102.8	4.40	2.5	600	26.1	16.7	0.64	0.78	28.7	33.5	1.1
				800	21.9	1.43	17.0	95.3	4.47	2.3	800	27.4	18.5	0.68	0.82	30.2	33.6	1.2
	6.0	2.6	5.9	600	22.0	1.45	17.1	104.0	4.45	2.6	600	26.6	16.9	0.63	0.73	29.1	36.4	1.0
				800	22.7	1.47	17.7	96.3	4.54	2.4	800	28.0	18.7	0.67	0.77	30.6	36.4	1.1
	7.0	3.2	7.3	600	22.5	1.46	17.5	104.7	4.51	2.7	600	26.9	18.0	0.67	0.71	29.3	37.6	0.9
				800	23.2	1.48	18.2	96.9	4.59	2.5	800	28.3	20.0	0.71	0.75	30.9	37.7	1.1
60	5.0	1.8	4.1	600	23.0	1.44	18.1	105.4	4.68	2.9	600	24.9	16.5	0.66	0.91	28.1	27.3	1.4
				800	23.7	1.45	18.8	97.4	4.80	2.7	800	26.2	18.4	0.70	0.95	29.4	27.4	1.5
	6.0	2.5	5.7	600	24.0	1.48	19.0	107.0	4.76	3.0	600	25.5	16.7	0.66	0.87	28.5	29.4	1.3
				800	24.8	1.49	19.7	98.7	4.88	2.7	800	26.7	18.6	0.69	0.90	29.8	29.6	1.4
	7.0	3.1	7.1	600	24.6	1.49	19.5	107.9	4.82	3.1	600	25.8	17.6	0.68	0.85	28.7	30.4	1.2
				800	25.4	1.50	20.3	99.4	4.96	2.8	800	27.1	19.6	0.72	0.89	30.1	30.6	1.3
70	5.0	1.7	3.9	600	24.7	1.46	19.8	108.2	4.97	3.3	600	23.8	16.4	0.69	1.05	27.4	22.7	1.8
				800	27.5	1.52	21.7	101.8	5.30	3.0	800	25.7	19.0	0.74	1.06	29.0	24.2	1.9
	6.0	2.4	5.5	600	26.0	1.51	20.9	110.2	5.06	3.4	600	24.4	16.6	0.68	1.01	27.9	24.3	1.7
				800	26.9	1.51	22.3	101.1	5.22	3.1	800	25.5	18.4	0.72	1.04	29.2	24.5	1.8
	7.0	3.0	6.8	600	26.7	1.53	21.5	111.2	5.13	3.5	600	24.7	17.2	0.70	0.98	28.0	25.2	1.5
				800	27.6	1.52	22.4	101.9	5.32	3.2	800	25.8	19.1	0.74	1.02	29.3	25.3	1.7
80	5.0	1.6	3.8	600	28.0	1.49	23.0	113.3	5.52	3.7	600	22.8	16.1	0.71	1.23	27.0	18.5	2.3
				800	29.0	1.48	24.0	103.6	5.76	3.4	800	23.7	17.9	0.76	1.27	28.0	18.7	2.5
	6.0	2.3	5.4	600	29.6	1.55	24.4	115.8	5.61	3.8	600	23.4	16.3	0.70	1.19	27.5	19.7	2.2
				800	30.7	1.53	25.4	105.5	5.86	3.5	800	24.4	18.1	0.74	1.22	28.5	19.9	2.4
	7.0	2.9	6.6	600	30.5	1.57	25.2	117.1	5.70	4.0	600	23.7	16.7	0.71	1.16	27.6	20.3	2.0
				800	31.6	1.55	26.3	106.5	5.98	3.6	800	24.7	18.5	0.75	1.20	28.7	20.5	2.2
90	5.0	1.6	3.7	600	31.3	1.52	26.1	118.3	6.04	4.2	600	21.8	15.8	0.73	1.41	26.6	15.4	3.0
				800	32.4	1.50	27.3	107.5	6.35	3.9	800	22.5	17.6	0.78	1.45	27.5	15.6	3.2
	6.0	2.2	5.2	600	33.3	1.59	27.9	121.3	6.14	4.3	600	22.4	16.0	0.71	1.37	27.1	16.3	2.8
				800	34.5	1.56	29.1	109.9	6.48	4.0	800	23.2	17.8	0.76	1.41	28.1	16.5	3.0
	7.0	2.8	6.4	600	34.3	1.61	28.8	123.0	6.25	4.5	600	22.2	15.4	0.69	1.34	26.8	16.6	2.5
				800	35.5	1.57	30.1	111.1	6.63	4.1	800	23.5	17.9	0.76	1.38	28.2	17.0	2.9
100	5.0	1.5	3.5	Operation not recommended							Operation not recommended							
	6.0	2.2	5.0								600	20.9	15.4	0.74	1.60	26.4	13.1	3.5
											800	21.6	17.1	0.79	1.63	27.2	13.3	3.8
	7.0	2.7	6.1								600	21.2	15.4	0.73	1.58	26.5	13.4	3.2
											800	21.9	17.0	0.78	1.60	27.3	13.7	3.6
110	5.0	1.5	3.4								Operation not recommended							
	6.0	2.1	4.8								600	19.5	14.8	0.76	1.83	25.7	10.6	4.3
											800	20.0	16.4	0.82	1.85	26.3	10.8	4.7
	7.0	2.6	5.9								600	19.7	14.6	0.74	1.80	25.8	10.9	4.0
											800	20.2	16.1	0.80	1.82	26.4	11.1	4.4
120	5.0	1.4	3.3								Operation not recommended							
	6.0	2.0	4.6								600	18.2	14.3	0.78	2.01	25.1	9.1	5.2
											800	18.6	15.5	0.83	2.07	25.6	9.0	5.7
	7.0	2.5	5.7								600	18.4	14.3	0.78	1.95	25.1	9.4	4.8
											800	18.8	15.5	0.82	2.01	25.7	9.4	5.4

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Performance Data cont.

036 - Dual Capacity with Variable Speed ECM High Speed (1250 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	5.0	1.3	3.0	Operation not recommended							Operation not recommended							
	7.0	2.8	6.5															
	9.0	4.0	9.2	1050	24.8	2.15	17.5	91.9	3.38	2.8								
				1250	25.4	2.14	18.1	88.8	3.48	2.5								
30	5.0	1.2	2.9	Operation not recommended							Operation not recommended							
	7.0	2.7	6.3	1050	28.1	2.12	20.9	94.8	3.88	2.9	1050	32.5	22.4	0.69	1.09	36.3	29.8	-
				1250	28.9	2.19	21.5	91.4	3.87	2.7	1250	33.1	24.5	0.74	1.15	37.0	28.8	-
	9.0	3.9	8.9	1050	28.8	2.22	21.2	95.4	3.80	3.0	1050	32.7	22.4	0.69	1.06	36.3	30.9	-
				1250	29.5	2.21	22.0	91.9	3.91	2.8	1250	33.5	24.5	0.73	1.11	37.3	30.2	-
40	5.0	1.2	2.8	Operation not recommended							Operation not recommended							
	7.0	2.6	6.1	1050	31.5	2.20	24.0	97.8	4.20	3.4	1050	38.0	25.9	0.68	1.35	42.5	28.2	-
				1250	32.5	2.24	24.8	94.1	4.24	3.1	1250	38.7	28.3	0.73	1.41	43.5	27.4	-
	9.0	3.7	8.7	1050	32.1	2.22	24.6	98.3	4.25	3.5	1050	38.2	25.9	0.68	1.31	42.7	29.3	-
				1250	33.2	2.27	25.4	94.6	4.29	3.1	1250	39.1	28.3	0.72	1.37	43.8	28.6	-
50	5.0	1.2	2.7	1050	33.7	2.22	26.1	99.7	4.45	3.6	1050	41.2	26.7	0.65	1.68	46.9	24.5	1.7
				1250	34.7	2.25	27.0	95.7	4.52	3.3	1250	43.3	29.7	0.68	1.77	49.3	24.5	1.8
	7.0	2.6	5.9	1050	34.9	2.27	27.2	100.8	4.51	3.7	1050	42.0	27.0	0.64	1.58	47.4	26.6	1.6
				1250	36.0	2.30	28.2	96.7	4.59	3.4	1250	44.2	30.0	0.68	1.66	49.9	26.7	1.8
	9.0	3.6	8.4	1050	35.7	2.29	27.9	101.5	4.57	3.8	1050	42.4	28.8	0.68	1.54	47.7	27.5	1.5
				1250	36.8	2.32	28.9	97.3	4.65	3.5	1250	44.7	32.0	0.72	1.62	50.2	27.6	1.7
60	5.0	1.1	2.6	1050	37.3	2.29	29.4	102.9	4.77	4.1	1050	39.1	26.3	0.67	1.87	45.5	20.9	2.1
				1250	38.5	2.31	30.6	98.5	4.89	3.8	1250	41.0	29.2	0.71	1.96	47.7	21.0	2.2
	7.0	2.5	5.7	1050	38.9	2.36	30.9	104.3	4.85	4.2	1050	40.1	26.6	0.66	1.78	46.1	22.5	2.0
				1250	40.2	2.37	32.1	99.8	4.97	3.9	1250	42.0	29.5	0.70	1.85	48.3	22.6	2.1
	9.0	3.5	8.1	1050	39.9	2.38	31.8	105.2	4.91	4.3	1050	40.5	28.0	0.69	1.74	46.4	23.3	1.8
				1250	41.2	2.39	33.0	100.5	5.05	4.0	1250	42.5	31.1	0.73	1.82	48.6	23.4	2.0
70	5.0	1.1	2.5	1050	40.9	2.36	32.8	106.1	5.07	4.7	1050	37.1	25.9	0.70	2.07	44.2	18.5	2.6
				1250	42.8	2.42	34.5	101.7	5.18	4.3	1250	39.1	29.7	2.12	2.17	46.5	18.0	2.8
	7.0	2.4	5.5	1050	43.0	2.44	34.7	107.9	5.16	4.8	1050	38.1	26.2	0.69	1.98	44.8	19.2	2.4
				1250	44.4	2.44	36.1	102.9	5.33	4.4	1250	39.7	29.0	0.73	2.05	46.7	19.4	2.6
	9.0	3.4	7.9	1050	44.1	2.47	35.7	108.9	5.23	5.0	1050	38.5	27.3	0.71	1.93	45.1	19.9	2.3
				1250	45.6	2.46	37.2	103.8	5.43	5.6	1250	40.2	30.2	0.75	2.01	47.1	20.0	2.5
80	5.0	1.1	2.5	1050	44.8	2.46	36.4	109.5	5.34	5.2	1050	35.6	25.7	0.72	2.29	43.4	15.6	3.2
				1250	46.4	2.44	38.0	104.3	5.57	4.8	1250	37.1	28.5	0.77	2.36	45.1	15.7	3.4
	7.0	2.3	5.4	1050	47.4	2.55	38.6	111.8	5.43	5.3	1050	36.6	26.0	0.71	2.20	44.2	16.6	3.0
				1250	49.0	2.53	40.3	106.3	5.67	4.9	1250	38.1	28.8	0.76	2.27	45.9	16.8	3.3
	9.0	3.3	7.6	1050	48.7	2.59	39.9	113.0	5.52	5.5	1050	37.0	26.6	0.72	2.16	44.4	17.1	2.8
				1250	50.4	2.55	41.7	107.3	5.79	5.1	1250	38.6	29.5	0.77	2.23	46.1	17.3	3.1
90	5.0	1.0	2.4	1050	48.7	2.55	40.0	112.9	5.59	5.9	1050	34.2	25.4	0.74	2.50	42.7	13.7	4.0
				1250	50.4	2.52	41.8	107.3	5.87	5.4	1250	35.4	28.3	0.80	2.56	44.1	13.8	4.3
	7.0	2.2	5.2	1050	51.7	2.67	42.6	115.6	5.68	6.0	1050	35.2	25.8	0.73	2.43	43.5	14.5	3.7
				1250	53.6	2.62	44.6	109.7	5.99	5.6	1250	36.5	28.6	0.78	2.49	45.0	14.7	4.1
	9.0	3.2	7.3	1050	53.4	2.71	44.1	117.1	5.78	6.2	1050	35.8	26.4	0.74	2.38	43.9	15.0	3.5
				1250	55.2	2.64	46.2	110.9	6.13	5.8	1250	36.9	28.8	0.78	2.44	45.2	15.1	3.9
100	5.0	1.0	2.3	Operation not recommended							Operation not recommended							
	7.0	2.2	5.0								1050	33.4	25.4	0.76	2.72	42.7	12.3	4.6
											1250	34.5	28.2	0.82	2.76	44.0	12.5	5.0
	9.0	3.1	7.1								1050	33.8	25.4	0.75	2.67	42.9	12.6	4.4
											1250	34.9	28.1	0.80	2.72	44.2	12.9	4.8
110	5.0	1.0	2.2								Operation not recommended							
	7.0	2.1	4.8								1050	31.7	25.1	0.79	3.01	42.0	10.5	5.6
											1250	32.6	27.9	0.86	3.03	42.9	10.7	6.1
	9.0	2.9	6.8								1050	32.0	24.7	0.77	2.96	42.1	10.8	5.2
											1250	32.9	27.3	0.83	2.99	43.1	11.0	5.8
120	5.0	0.9	2.1								Operation not recommended							
	7.0	2.0	4.6								1050	29.6	24.5	0.83	3.35	41.0	8.8	6.8
											1250	30.1	26.6	0.88	3.43	41.9	8.8	7.4
	9.0	2.8	6.5								1050	29.9	24.5	0.82	3.24	40.9	9.2	6.3
											1250	30.5	26.6	0.87	3.34	41.9	9.1	7.0

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Performance Data cont.

036 - Dual Capacity with Variable Speed ECM Low Speed (1050 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	4.0	1.2	2.7	Operation not recommended							Operation not recommended							
	6.0	2.5	5.7															
	8.0	3.8	8.8	900	17.2	1.58	11.9	87.7	3.20	2.4								
				1050	17.5	1.60	12.0	85.4	3.21	2.2								
30	4.0	1.1	2.6	Operation not recommended							Operation not recommended							
	6.0	2.4	5.5	900	19.7	1.62	14.2	90.3	3.56	2.3	900	28.3	18.1	0.64	0.81	31.0	35.1	-
				1050	20.3	1.67	14.6	87.9	3.55	2.1	1050	28.7	19.8	0.69	0.85	31.6	33.9	-
	8.0	3.7	8.5	900	20.4	1.67	14.7	91.0	3.58	2.4	900	28.4	18.1	0.64	0.78	31.1	36.4	-
				1050	20.7	1.69	14.9	88.3	3.59	2.2	1050	29.1	19.8	0.68	0.82	31.9	35.5	-
40	4.0	1.1	2.5	Operation not recommended							Operation not recommended							
	6.0	2.3	5.3	900	22.6	1.94	15.9	93.2	3.40	2.5	900	30.0	20.4	0.68	0.89	33.1	33.7	-
				1050	23.3	1.99	16.5	90.5	3.43	2.3	1050	30.6	22.3	0.73	0.94	33.8	32.7	-
	8.0	3.6	8.3	900	23.0	1.96	16.3	93.7	3.44	2.6	900	30.3	20.4	0.67	0.87	33.2	35.0	-
				1050	23.8	2.01	16.9	90.9	3.47	2.4	1050	31.0	22.3	0.72	0.91	34.0	34.2	-
50	4.0	1.1	2.5	900	24.5	2.22	17.0	95.2	3.24	2.6	900	30.2	20.6	0.68	1.03	33.7	29.5	0.9
				1050	25.3	2.25	17.6	92.3	3.29	2.4	1050	31.8	22.9	0.72	1.08	35.5	29.5	1.0
	6.0	2.2	5.2	900	25.4	2.27	17.7	96.1	3.28	2.7	900	30.9	20.8	0.68	0.97	34.2	31.9	0.9
				1050	26.2	2.30	18.4	93.1	3.34	2.5	1050	32.4	23.1	0.71	1.01	35.9	32.0	1.0
	8.0	3.5	8.0	900	26.0	2.29	18.2	96.7	3.33	2.8	900	31.1	22.2	0.71	0.94	34.4	33.0	0.8
				1050	26.8	2.32	18.9	93.6	3.39	2.5	1050	32.8	24.7	0.75	0.99	36.2	33.1	0.9
60	4.0	1.0	2.4	900	26.8	1.88	20.4	97.6	4.17	2.9	900	28.9	20.5	0.71	1.19	33.0	24.3	1.3
				1050	27.7	1.90	21.2	94.4	4.28	2.6	1050	30.3	22.8	0.75	1.24	34.5	24.4	1.3
	6.0	2.2	5.0	900	28.0	1.94	21.4	98.8	4.24	3.0	900	29.6	20.7	0.70	1.13	33.4	26.2	1.2
				1050	28.9	1.95	22.3	95.5	4.35	2.7	1050	31.0	23.0	0.74	1.17	35.0	26.4	1.3
	8.0	3.4	7.7	900	28.7	1.96	22.0	99.5	4.30	3.0	900	29.9	21.9	0.73	1.10	33.6	27.2	1.1
				1050	29.7	1.97	22.9	96.1	4.42	2.8	1050	31.4	24.3	0.77	1.15	35.3	27.3	1.2
70	4.0	1.0	2.3	900	29.1	1.55	23.9	100.0	5.52	3.2	900	27.6	20.4	0.74	1.35	32.2	20.5	1.7
				1050	30.4	1.67	24.7	96.8	5.34	2.9	1050	29.0	23.4	0.81	1.46	34.0	19.9	1.8
	6.0	2.1	4.9	900	30.6	1.60	25.2	101.5	5.62	3.3	900	28.3	20.7	0.73	1.29	32.7	21.9	1.6
				1050	31.6	1.60	26.2	97.9	5.81	3.0	1050	29.5	22.9	0.77	1.34	34.1	22.1	1.8
	8.0	3.2	7.5	900	31.4	1.62	25.9	102.3	5.70	3.4	900	28.6	21.5	0.75	1.26	32.9	22.7	1.5
				1050	32.5	1.61	27.0	98.7	5.92	3.1	1050	29.9	23.8	0.80	1.31	34.4	22.8	1.7
80	4.0	1.0	2.2	900	32.1	1.60	26.7	103.0	5.88	3.6	900	26.2	20.1	0.77	1.56	31.5	16.8	2.4
				1050	33.2	1.59	27.8	99.3	6.14	3.3	1050	27.2	22.4	0.82	1.61	32.7	16.9	2.6
	6.0	2.0	4.7	900	34.0	1.66	28.3	105.0	5.99	3.7	900	26.9	20.4	0.76	1.51	32.0	17.9	2.3
				1050	35.1	1.65	29.5	101.0	6.25	3.4	1050	28.0	22.6	0.81	1.55	33.3	18.0	2.5
	8.0	3.1	7.2	900	35.0	1.69	29.2	106.0	6.08	3.8	900	27.2	20.9	0.77	1.48	32.2	18.4	2.1
				1050	36.2	1.66	30.5	101.9	6.38	3.5	1050	28.3	23.2	0.82	1.52	33.5	18.6	2.3
90	4.0	0.9	2.2	900	35.1	1.65	29.4	106.1	6.22	4.0	900	24.7	19.9	0.80	1.77	30.8	13.9	3.2
				1050	36.3	1.63	30.8	102.0	6.54	3.7	1050	25.6	22.1	0.86	1.82	31.8	14.1	3.4
	6.0	2.0	4.5	900	37.3	1.73	31.4	108.4	6.32	4.2	900	25.5	20.1	0.79	1.72	31.3	14.8	3.0
				1050	38.6	1.70	32.8	104.1	6.67	3.8	1050	26.4	22.3	0.85	1.77	32.4	15.0	3.3
	8.0	3.0	7.0	900	38.5	1.75	32.5	109.6	6.43	4.3	900	26.1	20.9	0.80	1.71	31.9	15.3	2.8
				1050	39.8	1.71	34.0	105.1	6.82	4.0	1050	26.7	22.5	0.84	1.73	32.6	15.4	3.1
100	4.0	0.9	2.1	Operation not recommended							Operation not recommended							
	6.0	1.9	4.4								900	24.0	19.6	0.82	1.98	30.8	12.1	4.1
											1050	24.8	21.8	0.88	2.01	31.7	12.3	4.5
	8.0	2.9	6.7								900	24.3	19.6	0.81	1.95	30.9	12.4	0.8
											1050	25.1	21.7	0.86	1.98	31.8	12.7	4.2
110	4.0	0.9	2.0								Operation not recommended							
	6.0	1.8	4.2								900	22.6	19.1	0.85	2.25	30.2	10.0	5.2
											1050	23.2	21.2	0.92	2.26	30.9	10.2	5.7
	8.0	2.8	6.5								900	22.8	18.8	0.83	2.21	30.3	10.3	4.8
											1050	23.4	20.8	0.89	2.23	31.0	10.5	5.4
120	4.0	0.8	1.9								Operation not recommended							
	6.0	1.7	4.0								900	21.3	18.6	0.88	2.55	29.9	8.4	6.5
											1050	21.6	20.2	0.93	2.61	30.6	8.3	7.0
	8.0	2.7	6.2								900	21.4	18.6	0.87	2.46	29.8	8.7	6.0
											1050	21.9	20.2	0.92	2.54	30.6	8.6	6.7

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Performance Data cont.

042 - Dual Capacity with Variable Speed ECM High Speed (1350 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	5.0	1.5	3.5	Operation not recommended							Operation not recommended							
	8.0	3.6	8.4															
	11.0	5.7	13.3	1100	29.3	2.38	21.2	94.7	3.61	4.1								
				1300	29.5	2.33	21.6	91.0	3.71	3.7								
30	5.0	1.5	3.4	Operation not recommended							Operation not recommended							
	8.0	3.5	8.1	1100	32.7	2.32	24.8	97.5	4.14	4.3	1100	39.5	27.5	0.70	1.41	44.4	28.0	-
				1300	33.6	2.39	25.5	93.9	4.13	3.9	1300	40.2	30.1	0.75	1.49	45.2	27.0	-
	11.0	5.6	12.9	1100	34.1	2.46	25.7	98.7	4.06	4.4	1100	39.7	27.5	0.69	1.37	44.4	29.0	-
				1300	34.3	2.41	26.1	94.4	4.17	4.0	1300	40.7	30.1	0.74	1.44	45.6	28.3	-
40	5.0	1.4	3.3	Operation not recommended							Operation not recommended							
	8.0	3.4	7.9	1100	37.1	2.43	28.8	101.2	4.47	4.7	1100	42.7	28.9	0.68	1.59	48.1	26.8	-
				1300	38.2	2.49	29.8	97.2	4.51	4.3	1300	43.5	31.6	0.73	1.67	49.1	26.0	-
	11.0	5.4	12.5	1100	37.8	2.46	29.5	101.9	4.51	4.9	1100	43.0	28.9	0.67	1.54	48.3	27.8	-
				1300	39.1	2.51	30.5	97.8	4.56	4.4	1300	44.0	31.6	0.72	1.62	49.5	27.2	-
50	5.0	1.4	3.2	1100	40.1	2.50	31.6	103.7	4.71	5.1	1100	43.5	27.5	0.63	1.85	49.8	23.4	2.5
				1300	41.3	2.53	32.6	99.4	4.78	4.7	1300	45.7	30.6	0.67	1.95	52.4	23.5	2.6
	8.0	3.3	7.7	1100	41.5	2.55	32.8	105.0	4.77	5.3	1100	44.4	27.8	0.63	1.75	50.4	25.4	2.3
				1300	42.9	2.59	34.0	100.5	4.86	4.8	1300	46.7	30.9	0.66	1.83	52.9	25.5	2.5
	11.0	5.2	12.1	1100	42.5	2.58	33.7	105.7	4.83	5.4	1100	44.8	29.7	0.66	1.70	50.6	26.3	2.1
				1300	43.8	2.61	34.9	101.2	4.92	5.0	1300	47.2	33.0	0.70	1.79	53.3	26.4	2.4
60	5.0	1.3	3.1	1100	44.4	2.57	35.6	107.4	5.06	5.7	1100	43.8	28.2	0.65	2.05	50.8	21.3	3.0
				1300	45.8	2.59	37.0	102.7	5.19	5.3	1300	45.9	31.4	0.68	2.15	53.2	21.4	3.2
	8.0	3.2	7.4	1100	46.4	2.65	37.4	109.1	5.14	5.9	1100	44.8	28.6	0.64	1.95	51.4	22.9	2.8
				1300	47.9	2.66	38.8	104.1	5.27	5.4	1300	46.9	31.7	0.68	2.03	53.8	23.1	3.0
	11.0	5.1	11.7	1100	47.5	2.67	38.4	110.0	5.21	6.1	1100	45.2	30.1	0.67	1.90	51.7	23.7	2.6
				1300	49.1	2.69	39.9	105.0	5.36	5.6	1300	47.5	33.4	0.70	1.99	54.2	23.8	2.9
70	5.0	1.3	3.0	1100	35.4	2.65	26.4	99.8	3.92	6.4	1100	44.0	29.0	0.66	2.36	52.1	17.5	3.8
				1300	49.2	2.69	40.0	105.0	5.36	6.0	1300	47.0	33.6	0.71	2.43	54.7	19.3	4.0
	8.0	3.1	7.2	1100	51.3	2.74	41.9	113.2	5.49	6.6	1100	45.2	29.3	0.65	2.16	52.6	20.9	3.5
				1300	53.0	2.74	43.6	107.7	5.67	6.1	1300	47.1	32.5	0.69	2.23	55.2	21.1	3.8
	11.0	4.9	11.3	1100	52.6	2.77	43.2	114.3	5.56	6.8	1100	45.6	30.5	0.67	2.10	52.8	21.7	3.3
				1300	54.4	2.76	45.0	108.7	5.78	6.3	1300	47.7	33.8	0.71	2.19	55.3	21.8	3.6
80	5.0	1.3	2.9	1100	50.0	2.68	40.9	112.1	5.46	7.2	1100	42.4	28.4	0.67	2.52	51.0	16.9	4.8
				1300	51.8	2.66	42.7	106.9	5.70	6.7	1300	44.1	31.5	0.71	2.59	53.0	17.0	5.1
	8.0	3.0	6.9	1100	52.9	2.79	43.4	114.5	5.56	7.5	1100	43.6	28.7	0.66	2.43	51.9	18.0	4.5
				1300	54.7	2.76	45.3	109.0	5.80	6.9	1300	45.4	31.8	0.70	2.50	53.9	18.2	4.8
	11.0	4.7	10.9	1100	54.4	2.83	44.8	115.8	5.64	7.7	1100	44.1	29.4	0.67	2.38	52.2	18.5	4.1
				1300	56.3	2.79	46.8	110.1	5.92	7.1	1300	45.9	32.6	0.71	2.45	54.3	18.7	4.6
90	5.0	1.2	2.8	1100	51.3	2.72	42.0	113.2	5.53	88.1	1100	40.8	27.7	0.68	2.78	50.3	14.7	6.0
				1300	53.1	2.68	44.0	107.9	5.82	7.5	1300	42.3	30.8	0.73	2.85	52.0	14.9	6.4
	8.0	2.9	6.7	1100	54.5	2.84	44.9	115.9	5.63	8.4	1100	42.1	28.1	0.67	2.70	51.3	15.6	5.6
				1300	56.5	2.79	47.0	110.2	5.93	7.8	1300	43.6	31.2	0.71	2.77	53.1	15.8	6.1
	11.0	4.6	10.5	1100	56.3	2.88	46.4	117.4	5.72	8.6	1100	43.1	28.7	0.67	2.64	52.1	16.3	5.2
				1300	58.2	2.81	48.6	111.5	6.07	8.0	1300	44.1	31.4	0.71	2.71	53.3	16.3	5.8
100	5.0	1.2	2.7	Operation not recommended							Operation not recommended							
	8.0	2.8	6.4								1100	39.9	27.6	0.69	3.05	50.3	13.1	6.9
											1300	41.2	30.7	0.75	3.09	51.7	13.3	7.5
	11.0	4.4	10.2								1100	40.3	27.6	0.68	2.99	50.5	13.5	6.4
											1300	41.6	30.5	0.73	3.04	52.0	13.7	7.2
110	5.0	1.1	2.6								Operation not recommended							
	8.0	2.7	6.2								1100	37.7	27.2	0.72	3.39	49.3	11.1	8.5
											1300	38.7	30.2	0.78	3.42	50.4	11.3	9.2
	11.0	4.2	9.8								1100	38.1	26.8	0.70	3.33	49.4	11.4	7.9
											1300	39.1	29.6	0.76	3.37	50.6	11.6	8.8
120	5.0	1.1	2.5								Operation not recommended							
	8.0	2.6	5.9								1100	32.8	26.0	0.79	3.77	45.7	8.7	10.3
											1300	33.4	28.2	0.84	3.86	46.6	8.6	11.1
	11.0	4.1	9.4								1100	33.1	26.0	0.78	3.65	45.5	9.1	9.5
											1300	33.8	28.2	0.83	3.76	46.6	9.0	10.6

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Performance Data cont.

042 - Dual Capacity with Variable Speed ECM Low Speed (1350 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	4.0	0.9	2.2	Operation not recommended							Operation not recommended							
	6.0	2.1	4.9															
	8.0	3.3	7.6	900	19.5	1.79	13.4	90.0	3.19	3.7								
				1100	19.9	1.78	13.8	86.8	3.28	3.3								
30	4.0	0.9	2.1	Operation not recommended							Operation not recommended							
	6.0	2.0	4.7	900	21.5	1.72	15.6	92.1	3.66	3.9	900	31.2	22.1	0.71	0.86	34.1	36.1	-
				1100	22.4	1.77	16.3	88.8	3.71	3.4	1100	31.7	24.2	0.76	0.91	34.8	34.8	-
	8.0	3.2	7.4	900	23.3	1.82	17.1	94.0	3.75	3.8	900	31.3	22.1	0.71	0.84	34.2	37.4	-
				1100	23.8	1.81	17.6	90.0	3.85	3.3	1100	32.1	24.2	0.75	0.88	35.1	36.5	-
40	4.0	0.9	2.0	Operation not recommended							Operation not recommended							
	6.0	2.0	4.6	900	25.0	1.75	19.0	95.7	4.19	4.1	900	33.4	23.4	0.70	0.98	36.7	34.1	-
				1100	25.9	1.78	19.8	91.8	4.25	3.7	1100	34.0	25.5	0.75	1.03	37.5	33.1	-
	8.0	3.1	7.1	900	26.3	1.79	20.2	97.1	4.31	4.2	900	33.6	23.4	0.69	0.95	36.9	35.4	-
				1100	27.3	1.83	21.0	92.9	4.38	3.8	1100	34.4	25.5	0.74	1.00	37.8	34.6	-
50	4.0	0.9	2.0	900	27.5	1.78	21.5	98.3	4.54	4.3	900	34.8	23.5	0.67	1.13	38.7	30.9	1.6
				1100	28.4	1.80	22.2	93.9	4.62	3.9	1100	35.8	26.0	0.73	1.00	39.2	35.8	1.7
	6.0	1.9	4.4	900	28.5	1.78	22.4	99.3	4.70	4.4	900	35.1	23.6	0.67	1.10	38.9	32.0	1.5
				1100	29.3	1.80	23.2	94.7	4.78	4.1	1100	36.1	26.1	0.72	1.12	39.9	32.2	1.6
	8.0	3.0	6.9	900	29.8	1.82	23.6	100.7	4.81	4.7	900	35.7	24.2	0.68	1.09	39.4	32.8	1.4
				1100	30.7	1.84	24.4	95.8	4.89	4.2	1100	36.7	26.8	0.73	1.11	40.5	33.1	1.5
60	4.0	0.8	1.9	900	31.5	1.81	25.3	102.4	5.09	4.8	900	33.3	22.7	0.68	1.32	37.8	25.3	2.3
				1100	32.3	1.83	26.0	97.2	5.18	4.4	1100	34.3	25.2	0.73	1.34	38.8	25.6	2.4
	6.0	1.9	4.3	900	32.8	1.81	26.6	103.7	5.30	5.0	900	33.6	22.9	0.68	1.28	38.0	26.3	2.1
				1100	33.5	1.82	27.3	98.2	5.39	5.1	1100	34.6	25.3	0.73	1.31	39.0	26.5	2.3
	8.0	2.9	6.7	900	33.9	1.85	27.6	104.9	5.37	4.7	900	34.2	23.4	0.69	1.27	38.5	26.9	1.9
				1100	34.7	1.86	28.3	99.2	5.46	5.3	1100	35.2	26.0	0.74	1.30	39.6	27.1	2.2
70	4.0	0.8	1.8	900	35.4	1.85	29.1	106.4	5.61	5.0	900	31.9	22.0	0.69	1.50	37.0	21.2	3.0
				1100	35.6	1.86	29.3	100.0	5.61	5.5	1100	33.5	24.9	0.74	1.63	38.2	20.6	3.1
	6.0	1.8	4.2	900	37.0	1.84	30.7	108.0	5.88	5.0	900	32.2	22.1	0.69	1.46	37.2	22.0	2.8
				1100	37.7	1.84	31.4	101.7	5.99	5.6	1100	33.1	24.5	0.74	1.49	38.6	22.1	3.0
	8.0	2.8	6.5	900	37.9	1.88	31.5	109.0	5.90	5.2	900	32.7	22.7	0.69	1.45	37.6	22.5	2.6
				1100	38.6	1.88	32.2	102.5	6.02	6.0	1100	33.6	25.1	0.75	1.48	39.1	22.7	2.8
80	4.0	0.8	1.8	900	39.6	1.88	33.2	110.8	6.18	5.5	900	31.0	21.8	0.70	1.73	36.9	17.9	4.2
				1100	40.2	1.87	33.8	103.8	6.30	6.2	1100	31.8	24.1	0.76	1.77	37.9	18.0	4.4
	6.0	1.7	4.0	900	41.5	1.87	35.2	112.7	6.52	6.3	900	31.3	21.9	0.70	1.69	37.0	18.5	3.9
				1100	42.0	1.85	35.7	105.4	6.64	5.8	1100	32.1	24.3	0.76	1.72	38.0	18.7	4.2
	8.0	2.7	6.3	900	42.1	1.91	35.6	113.3	6.47	6.4	900	31.8	22.5	0.71	1.67	37.5	19.0	3.6
				1100	42.6	1.89	36.1	105.8	6.60	6.0	1100	32.7	24.9	0.76	1.71	38.5	19.1	4.0
90	4.0	0.7	1.7	900	43.8	1.91	37.3	115.1	6.73	6.5	900	30.1	21.6	0.72	1.96	36.8	15.3	5.4
				1100	44.2	1.89	37.8	107.2	6.87	6.4	1100	30.9	23.9	0.77	2.00	37.7	15.5	5.7
	6.0	1.7	3.9	900	46.1	1.89	39.6	117.4	7.14	6.6	900	30.3	21.8	0.72	1.91	36.9	15.9	5.0
				1100	46.4	1.87	40.0	109.0	7.28	6.9	1100	31.2	24.1	0.77	1.95	37.8	16.0	5.5
	8.0	2.6	6.0	900	46.3	1.93	39.7	117.6	7.03	7.0	900	30.8	21.9	0.71	1.91	37.3	16.1	4.7
				1100	46.5	1.90	41.0	109.1	7.17	6.6	1100	31.7	24.7	0.78	1.93	38.3	16.4	5.2
100	4.0	0.7	1.7	Operation not recommended							Operation not recommended							
	6.0	1.6	3.7								900	27.3	21.0	0.77	2.20	34.8	12.4	6.1
											1100	28.0	23.2	0.83	2.24	35.7	12.5	6.6
	8.0	2.5	5.8								900	27.7	21.5	0.78	2.18	35.2	12.7	5.8
											1100	28.5	23.8	0.84	2.23	36.1	12.8	6.6
110	4.0	0.7	1.6								Operation not recommended							
	6.0	1.6	3.6								900	24.2	20.2	0.83	2.49	32.7	9.7	7.2
											1100	24.9	22.3	0.90	2.54	33.6	9.8	8.2
	8.0	2.4	5.6								900	24.6	20.7	0.84	2.47	33.1	10.0	6.9
											1100	25.3	22.9	0.91	2.52	33.9	10.0	7.8
120	4.0	0.7	1.5								Operation not recommended							
	6.0	1.5	3.5								900	22.1	20.4	0.92	2.85	31.8	7.8	8.9
											1100	22.5	22.1	0.98	2.92	32.5	7.7	9.1
	8.0	2.3	5.4								900	22.3	20.4	0.91	2.75	31.7	8.1	8.5
											1100	22.8	22.1	0.97	2.84	32.5	8.0	9.6

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Performance Data cont.

048 - Dual Capacity with Variable Speed ECM High Speed (1550 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	6.0	1.4	3.2	Operation not recommended							Operation not recommended							
	9.0	2.8	6.5															
	12.0	4.2	9.7	1350	33.3	2.92	23.4	92.8	3.35	4.7								
				1550	33.4	2.85	23.7	90.0	3.43	4.2								
30	6.0	1.4	3.2	Operation not recommended							Operation not recommended							
	9.0	2.7	6.3	1350	36.6	2.82	26.9	95.1	3.80	4.9	1350	43.5	26.1	0.60	1.86	49.8	23.4	-
				1550	37.6	2.91	27.7	92.5	3.79	4.5	1550	44.2	28.5	0.64	1.95	50.9	22.6	-
	12.0	4.1	9.5	1350	38.3	3.01	28.0	96.3	3.73	5.0	1350	43.7	26.1	0.60	1.80	49.9	24.3	-
				1550	38.4	2.94	28.4	92.9	3.83	4.6	1550	44.8	28.5	0.64	1.89	51.2	23.7	-
40	6.0	1.3	3.1	Operation not recommended							Operation not recommended							
	9.0	2.6	6.1	1350	41.8	2.94	31.8	98.7	4.17	5.6	1350	47.8	30.4	0.64	2.01	54.6	23.8	-
				1550	43.1	3.00	32.9	95.7	4.21	5.2	1550	48.6	33.2	0.68	2.11	55.8	23.1	-
	12.0	4.0	9.2	1350	42.6	2.97	32.5	99.2	4.21	5.8	1350	48.1	30.4	0.63	1.95	54.8	24.7	-
				1550	44.0	3.03	33.7	96.3	4.26	5.3	1550	49.2	33.2	0.67	2.04	56.2	24.1	-
50	6.0	1.3	3.0	1350	45.4	2.98	35.2	101.1	4.46	6.1	1350	49.4	31.5	0.64	2.27	57.1	21.8	2.7
				1550	46.7	3.02	36.4	97.9	4.53	5.6	1550	52.0	35.0	0.67	2.39	60.1	21.8	2.9
	9.0	2.6	5.9	1350	47.0	3.05	36.6	102.3	4.52	6.3	1350	50.4	31.9	0.63	2.14	57.7	23.6	2.5
				1550	48.5	3.09	38.0	99.0	4.60	5.8	1550	53.0	35.4	0.67	2.24	60.7	23.6	2.7
	12.0	3.8	8.9	1350	48.1	3.08	37.6	103.0	4.58	6.5	1350	50.9	34.0	0.67	2.09	58.0	24.4	2.3
				1550	49.6	3.12	39.0	99.6	4.66	5.9	1550	53.6	37.8	0.71	2.19	61.1	24.5	2.6
60	6.0	1.2	2.9	1350	49.9	3.11	39.3	104.2	4.71	6.9	1350	48.2	31.7	0.66	2.49	56.7	19.3	3.2
				1550	51.5	3.13	40.8	100.8	4.83	6.4	1550	50.5	35.2	0.70	2.60	59.4	19.4	3.4
	9.0	2.5	5.7	1350	52.1	3.19	41.2	105.8	4.78	7.1	1350	49.3	32.0	0.65	2.37	57.4	20.8	3.0
				1550	53.8	3.21	42.9	102.1	4.91	6.6	1550	51.7	35.5	0.69	2.47	60.1	20.9	3.2
	12.0	3.7	8.6	1350	53.4	3.23	42.4	106.6	4.85	7.3	1350	49.8	33.8	0.68	2.31	57.7	21.5	2.7
				1550	55.2	3.24	44.1	102.9	4.99	6.7	1550	52.3	37.5	0.72	2.42	60.5	21.6	3.1
70	6.0	1.2	2.8	1350	54.4	3.23	43.4	107.3	4.94	7.9	1350	47.0	31.8	0.68	2.72	56.3	17.5	3.9
				1550	56.2	3.27	45.0	103.6	5.04	7.3	1550	49.8	36.8	0.74	2.87	59.5	17.4	4.2
	9.0	2.4	5.5	1350	57.2	3.33	45.9	109.3	5.03	8.1	1350	48.2	32.2	0.67	2.60	57.1	18.5	3.7
				1550	59.1	3.33	47.7	105.3	5.20	7.5	1550	50.3	35.7	0.71	2.69	59.6	18.7	4.0
	12.0	3.6	8.3	1350	58.7	3.37	47.2	110.3	5.10	8.4	1350	48.7	33.5	0.69	2.54	57.4	19.2	3.4
				1550	60.7	3.36	49.2	106.3	5.29	7.7	1550	50.9	37.1	0.73	2.64	59.9	19.3	3.8
80	6.0	1.2	2.7	1350	57.4	3.32	46.1	109.4	5.07	8.7	1350	44.9	32.0	0.71	3.01	55.2	14.9	5.1
				1550	59.4	3.29	48.2	105.5	5.29	8.1	1550	46.7	35.6	0.76	3.11	57.3	15.0	5.4
	9.0	2.3	5.4	1350	60.7	3.45	48.9	111.6	5.15	9.0	1350	46.1	32.4	0.70	2.91	56.1	15.9	4.7
				1550	62.8	3.42	51.1	107.5	5.38	8.3	1550	48.0	35.9	0.75	2.99	58.2	16.0	5.1
	12.0	3.5	8.0	1350	62.5	3.50	50.5	112.8	5.23	9.3	1350	46.6	33.2	0.71	2.85	56.4	16.4	4.4
				1550	64.6	3.45	52.8	108.6	5.50	8.6	1550	48.6	36.8	0.76	2.94	58.6	16.5	4.9
90	6.0	1.1	2.6	1350	60.4	3.41	48.7	111.4	5.18	9.7	1350	42.8	32.2	0.75	3.31	54.1	12.9	6.3
				1550	62.5	3.36	51.1	107.4	5.45	9.0	1550	44.3	35.8	0.81	3.39	55.9	13.1	6.7
	9.0	2.2	5.2	1350	64.2	3.57	52.0	114.0	5.27	10.0	1350	44.1	32.7	0.74	3.22	55.0	13.7	5.9
				1550	66.5	3.50	54.5	109.7	5.56	9.3	1550	45.7	36.2	0.79	3.30	56.9	13.9	6.4
	12.0	3.4	7.7	1350	66.2	3.62	53.9	115.4	5.36	10.3	1350	45.2	33.3	0.74	3.20	56.1	14.1	5.5
				1550	68.5	3.53	56.5	110.9	5.69	9.6	1550	46.2	36.5	0.79	3.23	57.2	14.3	6.1
100	6.0	1.1	2.5	Operation not recommended							Operation not recommended							
	9.0	2.2	5.0								1350	41.2	31.8	0.77	3.59	53.5	11.5	7.5
											1550	42.6	35.3	0.83	3.65	55.0	11.7	8.1
	12.0	3.2	7.5								1350	41.7	31.7	0.76	3.53	53.7	11.8	7.0
											1550	43.1	35.1	0.81	3.59	55.3	12.0	7.7
110	6.0	1.0	2.4								Operation not recommended							
	9.0	2.1	4.8								1350	38.5	30.9	0.80	3.97	52.0	9.7	9.3
											1550	39.5	34.3	0.87	4.00	53.1	9.9	10.1
	12.0	3.1	7.2								1350	38.8	30.4	0.78	3.90	52.1	10.0	8.7
											1550	39.9	33.6	0.84	3.94	53.3	10.1	9.6
120	6.0	1.0	2.3								Operation not recommended							
	9.0	2.0	4.6								1350	37.1	29.3	0.79	4.40	52.1	8.4	11.3
											1550	37.7	31.8	0.84	4.51	53.1	8.4	12.2
	12.0	3.0	6.9								1350	37.4	29.3	0.78	4.26	51.9	8.8	10.5
											1550	38.2	31.8	0.83	4.39	53.2	8.7	11.6

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Performance Data cont.

048 - Dual Capacity with Variable Speed ECM Low Speed (1350 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	5.0	1.1	2.4	Operation not recommended							Operation not recommended							
	8.0	2.3	5.4															
	11.0	3.6	8.4	1150	22.0	2.23	14.4	87.7	2.89	4.1								
				1350	22.1	2.22	14.5	85.2	2.92	3.7								
30	5.0	1.0	2.4	Operation not recommended							Operation not recommended							
	8.0	2.3	5.3	1150	24.4	2.13	17.2	89.7	3.37	4.2	1150	32.9	25.0	0.76	1.07	36.6	30.8	-
				1350	25.5	2.19	18.0	87.5	3.41	3.8	1350	33.5	27.3	0.82	1.13	37.3	29.7	-
	11.0	3.5	8.1	1150	27.0	2.25	19.3	91.7	3.52	4.3	1150	33.1	25.0	0.75	1.04	36.6	31.9	-
				1350	27.1	2.24	19.5	88.6	3.55	3.9	1350	33.9	27.3	0.81	1.09	37.6	31.1	-
40	5.0	1.0	2.3	Operation not recommended							Operation not recommended							
	8.0	2.2	5.1	1150	29.2	2.18	21.7	93.5	3.92	4.5	1150	36.4	26.7	0.73	1.23	40.6	29.6	-
				1350	30.2	2.22	22.6	90.7	3.98	4.2	1350	37.1	29.1	0.78	1.29	41.5	28.7	-
	11.0	3.4	7.9	1150	30.7	2.23	23.1	94.8	4.04	4.7	1150	36.7	26.7	0.73	1.20	40.8	30.7	-
				1350	31.8	2.28	24.0	91.8	4.10	4.2	1350	37.6	29.1	0.77	1.25	41.8	30.0	-
50	5.0	1.0	2.2	1150	32.7	2.23	25.1	96.3	4.30	4.8	1150	39.1	27.1	0.69	1.43	44.0	27.3	1.6
				1350	33.7	2.26	26.0	93.1	4.37	4.4	1350	40.2	30.0	0.75	1.35	44.8	29.8	1.7
	8.0	2.1	4.9	1150	33.9	2.23	26.3	97.3	4.45	4.9	1150	39.4	27.2	0.69	1.40	44.2	28.3	1.5
				1350	34.9	2.26	27.2	93.9	4.53	4.5	1350	40.5	30.1	0.74	1.42	45.4	28.5	1.6
	11.0	3.3	7.7	1150	35.5	2.28	27.7	98.5	4.55	5.1	1150	40.1	27.9	0.70	1.38	44.8	29.0	1.4
				1350	36.5	2.31	28.6	95.0	4.63	4.6	1350	41.2	30.9	0.75	1.41	46.0	29.2	1.5
60	5.0	0.9	2.2	1150	37.2	2.27	29.4	99.9	4.80	5.2	1150	38.5	27.1	0.70	1.64	44.1	23.5	2.3
				1350	38.1	2.29	30.3	96.1	4.88	4.8	1350	39.6	30.0	0.76	1.67	45.3	23.7	2.4
	8.0	2.1	4.8	1150	38.7	2.27	30.9	101.1	5.00	5.4	1150	38.9	27.2	0.70	1.60	44.3	24.3	2.1
				1350	39.6	2.28	31.8	97.1	5.08	5.0	1350	39.9	30.1	0.75	1.63	45.5	24.5	2.3
	11.0	3.2	7.4	1150	40.0	2.32	32.1	102.2	5.06	5.5	1150	39.5	27.9	0.71	1.58	44.9	24.9	1.9
				1350	40.9	2.33	33.0	98.1	5.14	5.1	1350	40.6	30.9	0.76	1.62	46.1	25.1	2.2
70	5.0	0.9	2.1	1150	41.6	2.31	33.7	103.5	5.27	5.8	1150	37.9	27.1	0.71	1.85	44.3	20.5	3.0
				1350	39.1	2.20	31.6	96.8	5.21	5.4	1350	38.3	30.6	0.80	2.11	45.5	18.2	3.1
	8.0	2.0	4.6	1150	43.4	2.30	35.5	104.9	5.52	6.0	1150	38.3	27.2	0.71	1.80	44.4	21.3	2.8
				1350	44.2	2.30	36.3	100.3	5.63	5.5	1350	39.4	30.1	0.77	1.84	45.6	21.4	3.0
	11.0	3.1	7.2	1150	41.4	2.33	33.5	103.3	5.21	6.1	1150	38.9	27.9	0.72	1.79	45.0	21.8	2.8
				1350	45.3	2.35	37.3	101.1	5.65	5.7	1350	40.0	30.9	0.77	1.82	46.2	22.0	3.1
80	5.0	0.9	2.0	1150	46.3	2.35	38.3	107.3	5.77	6.5	1150	36.0	26.6	0.74	2.16	43.4	16.7	4.4
				1350	47.0	2.34	39.0	102.2	5.88	6.0	1350	37.0	29.4	0.80	2.20	44.5	16.8	4.6
	8.0	1.9	4.5	1150	48.6	2.34	40.6	109.1	6.09	6.7	1150	36.3	26.7	0.74	2.10	43.5	17.3	4.1
				1350	49.1	2.32	41.2	103.7	6.21	6.1	1350	37.3	29.6	0.79	2.14	44.7	17.4	34.4
	11.0	3.0	6.9	1150	49.2	2.39	41.1	109.6	6.05	6.9	1150	36.9	27.4	0.74	2.08	44.0	17.7	3.8
				1350	49.8	2.37	41.7	104.1	6.17	6.3	1350	38.0	30.4	0.80	2.13	45.2	17.9	4.2
90	5.0	0.8	1.9	1150	51.1	2.39	42.9	111.1	6.26	7.2	1150	34.1	26.1	0.77	2.47	42.5	13.8	5.9
				1350	51.5	2.36	43.4	105.3	6.39	6.7	1350	35.0	28.9	0.83	2.52	43.6	13.9	6.2
	8.0	1.9	4.3	1150	53.7	2.37	45.6	113.3	6.64	7.4	1150	34.4	26.3	0.76	2.41	42.6	14.3	5.5
				1350	54.1	2.34	46.1	107.1	6.78	6.9	1350	35.3	29.1	0.82	2.45	43.7	14.4	5.9
	11.0	2.9	6.7	1150	54.0	2.42	45.7	113.4	6.54	7.7	1150	34.8	27.3	0.78	2.38	42.9	14.6	5.1
				1350	54.2	2.38	46.2	107.2	6.67	7.1	1350	35.9	29.8	0.83	2.43	44.2	14.8	5.6
100	5.0	0.8	1.9	Operation not recommended							Operation not recommended							
	8.0	1.8	4.2								1150	31.5	25.6	0.81	2.77	40.9	11.4	7.1
											1350	32.4	28.4	0.88	2.82	42.0	11.5	7.7
	11.0	2.8	6.4								1150	32.0	26.3	0.82	2.75	41.4	11.7	6.6
											1350	32.9	29.1	0.88	2.80	42.5	11.8	7.3
110	5.0	0.8	1.8								Operation not recommended							
	8.0	1.7	4.0								1150	28.6	25.0	0.87	3.14	39.3	9.1	9.0
											1350	29.4	27.7	0.94	3.20	40.3	9.2	9.6
	11.0	2.7	6.2								1150	29.1	25.7	0.88	3.11	39.7	9.4	8.2
											1350	29.9	28.4	0.95	3.17	40.7	9.4	8.9
120	5.0	0.7	1.7								Operation not recommended							
	8.0	1.7	3.8								1150	24.7	22.4	0.91	3.59	36.9	6.9	10.5
											1350	25.1	24.3	0.97	3.68	37.7	6.8	11.3
	11.0	2.6	5.9								1150	24.9	22.4	0.90	3.47	36.7	7.2	9.9
											1350	25.4	24.3	0.96	3.58	37.6	7.1	11.0

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Performance Data cont.

060 - Dual Capacity with Variable Speed ECM High Speed (1800 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	8.0	2.7	6.2	Operation not recommended							Operation not recommended							
	12.0	4.9	11.4															
	16.0	7.3	16.8	1500	31.2	3.44	19.5	89.3	2.66	5.2								
				1800	32.3	3.47	20.5	86.6	2.73	4.7								
30	8.0	2.6	6.0	Operation not recommended							Operation not recommended							
	12.0	4.8	11.0	1500	38.2	3.65	25.7	93.5	3.06	5.5	1500	52.1	37.7	0.72	2.23	59.7	23.4	-
				1800	39.7	3.75	27.0	90.4	3.11	5.1	1800	52.9	41.2	0.78	2.35	60.9	22.5	-
	16.0	7.0	16.3	1500	40.9	3.81	27.9	95.2	3.15	5.8	1500	52.3	37.7	0.72	2.16	59.7	24.2	-
				1800	42.3	3.84	29.2	91.8	3.23	5.2	1800	53.6	41.2	0.77	2.27	61.3	23.6	-
40	8.0	2.5	5.9	Operation not recommended							Operation not recommended							
	12.0	4.6	10.7	1500	47.5	3.89	34.3	99.3	3.58	6.1	1500	59.3	40.4	0.68	2.62	68.2	22.6	-
				1800	49.2	3.96	35.7	95.3	3.64	5.7	1800	60.4	44.2	0.73	2.74	69.7	22.0	-
	16.0	6.8	15.8	1500	50.1	3.98	36.5	100.9	3.69	6.6	1500	59.7	40.4	0.68	2.54	68.4	23.5	-
				1800	51.8	4.06	38.0	96.6	3.74	6.0	1800	61.1	44.2	0.72	2.66	70.1	23.0	-
50	8.0	2.5	5.7	1500	54.9	4.12	40.9	103.9	3.91	6.9	1500	65.0	41.3	0.63	3.09	75.5	21.0	3.8
				1800	56.7	4.18	42.4	99.1	3.97	6.4	1800	66.8	45.7	0.68	1.00	70.2	23.3	4.0
	12.0	4.5	10.4	1500	56.9	4.12	42.8	105.1	4.04	7.2	1500	65.6	41.5	0.63	3.01	75.8	21.8	3.6
				1800	58.6	4.18	44.3	100.1	4.11	6.6	1800	67.4	45.9	0.68	3.07	77.9	22.0	3.9
	16.0	6.6	15.3	1500	59.5	4.22	45.1	106.8	4.14	7.4	1500	66.7	42.6	0.64	2.98	76.8	22.3	3.3
				1800	61.3	4.27	46.7	101.5	4.21	6.8	1800	68.5	47.1	0.69	3.04	78.9	22.5	3.7
60	8.0	2.4	5.5	1500	65.0	4.43	49.9	110.1	4.30	7.8	1500	62.8	40.1	0.64	3.38	74.3	18.5	4.6
				1800	66.6	4.46	51.4	104.3	4.37	7.2	1800	64.5	44.4	0.69	3.45	76.3	18.7	4.9
	12.0	4.3	10.0	1500	67.6	4.42	52.5	111.7	4.48	8.1	1500	63.3	40.3	0.64	3.30	74.6	19.2	4.3
				1800	69.2	4.45	54.0	105.6	4.56	7.4	1800	65.1	44.6	0.69	3.36	76.5	19.4	4.7
	16.0	6.4	14.8	1500	70.0	4.52	54.5	113.2	4.53	8.5	1500	64.4	41.3	0.64	3.27	75.5	19.7	4.0
				1800	71.6	4.55	56.0	106.8	4.61	7.6	1800	66.2	45.8	0.69	3.33	77.5	19.9	4.4
70	8.0	2.3	5.3	1500	75.1	4.75	58.9	116.3	4.64	8.9	1500	60.5	38.9	0.64	3.68	73.1	16.5	5.6
				1800	74.7	4.61	59.0	108.4	4.75	8.2	1800	62.5	43.5	0.70	3.94	75.2	15.9	6.0
	12.0	4.2	9.7	1500	78.4	4.73	62.2	118.4	4.86	9.2	1500	61.1	39.1	0.64	3.58	73.3	17.0	5.3
				1800	79.8	4.72	63.7	111.1	4.95	8.4	1800	62.8	43.3	0.69	3.65	75.9	17.2	5.7
	16.0	6.2	14.3	1500	80.4	4.83	63.9	119.6	4.88	9.5	1500	62.1	40.1	0.65	3.55	74.2	17.5	4.9
				1800	81.8	4.82	65.4	112.1	4.97	8.7	1800	63.8	44.4	0.70	3.62	76.2	17.6	5.4
80	8.0	2.2	5.1	1500	82.7	5.04	65.5	121.0	4.81	9.8	1500	58.0	38.5	0.66	4.04	71.8	14.3	7.3
				1800	83.8	5.01	66.7	113.1	4.90	9.1	1800	59.6	42.6	0.71	4.12	73.7	14.5	7.7
	12.0	4.1	9.4	1500	86.6	5.01	69.5	123.5	5.07	10.2	1500	58.5	38.7	0.66	3.94	72.0	14.9	6.8
				1800	87.6	4.97	70.7	115.1	5.17	9.4	1800	60.2	42.9	0.71	4.02	73.9	15.0	7.4
	16.0	6.0	13.8	1500	87.8	5.11	70.4	124.2	5.04	10.5	1500	59.5	39.7	0.67	3.90	72.8	15.2	6.3
				1800	88.8	5.07	71.5	115.7	5.14	9.6	1800	61.2	44.0	0.72	3.98	74.7	15.4	7.0
90	8.0	2.1	5.0	1500	90.2	5.34	72.0	125.7	4.95	10.9	1500	55.5	38.1	0.69	4.41	70.5	12.6	9.3
				1800	90.9	5.27	73.0	116.8	5.06	10.0	1800	57.0	42.2	0.74	4.49	72.4	12.7	9.8
	12.0	3.9	9.0	1500	94.9	5.29	76.8	128.6	5.26	111.2	1500	56.0	38.3	0.68	4.30	70.7	13.0	8.6
				1800	95.5	5.22	77.6	119.1	5.36	10.4	1800	57.6	42.4	0.74	4.38	72.5	13.1	9.4
	16.0	5.8	13.3	1500	95.3	5.40	76.9	128.8	5.17	11.6	1500	58.1	39.4	0.68	4.17	72.3	13.9	8.0
				1800	95.7	5.31	77.8	119.2	5.28	10.8	1800	58.5	43.5	0.74	4.34	73.3	13.5	8.9
100	8.0	2.1	4.8	Operation not recommended							Operation not recommended							
	12.0	3.8	8.7								1500	53.2	37.5	0.70	4.77	69.5	11.1	10.5
											1800	54.7	41.5	0.76	4.86	71.2	11.2	11.4
	16.0	5.6	12.9								1500	54.1	38.4	0.71	4.73	70.2	11.4	9.8
											1800	55.6	42.6	0.77	4.82	72.0	11.5	10.9
110	8.0	2.0	4.6								Operation not recommended							
	12.0	3.6	8.4								1500	50.4	36.6	0.73	5.25	68.2	9.6	13.2
											1800	51.7	40.6	0.78	5.35	70.0	9.7	14.5
	16.0	5.4	12.4								1500	51.2	37.6	0.73	5.20	68.9	9.8	12.4
											1800	52.6	41.6	0.79	5.30	70.7	9.9	13.8
120	8.0	1.9	4.4								Operation not recommended							
	12.0	3.5	8.1								1500	48.4	33.3	0.69	5.90	68.6	8.2	16.0
											1800	49.3	36.1	0.73	6.05	70.0	8.1	17.4
	16.0	5.1	11.9								1500	48.9	33.3	0.68	5.71	68.3	8.6	14.8
											1800	49.9	36.1	0.72	5.89	70.0	8.5	16.5

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Performance Data cont.

060 - Dual Capacity with Variable Speed ECM Low Speed (1500 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	6.0	1.9	4.3	Operation not recommended							Operation not recommended							
	10.0	3.7	8.7															
	14.0	5.7	13.3	1250	25.2	2.77	15.7	88.6	2.66	4.1								
				1500	26.2	2.76	16.8	86.2	2.78	3.8								
30	6.0	1.8	4.2	Operation not recommended							Operation not recommended							
	10.0	3.6	8.4	1250	29.6	2.74	20.2	91.9	3.17	4.1	1250	44.8	32.4	0.72	1.38	49.5	32.3	-
				1500	30.8	2.81	21.2	89.0	3.21	3.7	1500	45.5	35.4	0.78	1.46	50.5	31.2	-
	14.0	5.6	12.9	1250	31.5	2.89	21.6	93.3	3.19	4.2	1250	45.0	32.4	0.72	1.34	49.6	33.5	-
				1500	32.8	2.88	23.0	90.2	3.34	3.8	1500	46.1	35.4	0.77	1.41	50.9	32.7	-
40	6.0	1.8	4.1	Operation not recommended							Operation not recommended							
	10.0	3.5	8.2	1250	35.5	2.81	25.9	96.3	3.70	4.6	1250	46.8	32.8	0.70	1.55	52.1	30.3	-
				1500	36.7	2.87	27.0	92.7	3.76	4.1	1500	47.7	35.8	0.75	1.62	53.2	29.4	-
	14.0	5.4	12.5	1250	37.4	2.88	27.6	97.7	3.81	4.7	1250	47.2	32.8	0.69	1.50	52.3	31.4	-
				1500	38.7	2.94	28.7	93.9	3.86	4.3	1500	48.3	35.8	0.74	1.57	53.6	30.7	-
50	6.0	1.7	3.9	1250	40.0	2.89	30.1	99.6	4.06	4.8	1250	47.8	31.7	0.66	1.76	53.8	27.2	1.9
				1500	41.2	2.93	31.2	95.4	4.13	4.4	1500	49.1	35.1	0.71	1.74	55.1	32.5	2.0
	10.0	3.4	7.9	1250	41.4	2.89	31.5	100.7	4.20	5.0	1250	48.2	31.9	0.66	1.71	54.1	28.2	1.8
				1500	42.6	2.92	32.7	96.3	4.27	4.6	1500	49.6	35.3	0.71	1.75	55.5	28.4	1.9
	14.0	5.2	12.1	1250	43.3	2.95	33.2	102.1	4.30	5.2	1250	49.0	32.7	0.67	1.70	54.8	28.9	1.6
				1500	44.6	2.99	34.4	97.5	4.37	4.8	1500	50.4	36.2	0.72	1.73	56.3	29.1	1.8
60	6.0	1.7	3.8	1250	46.0	2.95	36.0	104.1	4.57	5.6	1250	45.9	31.3	0.68	2.03	52.8	22.6	2.6
				1500	47.2	2.97	37.0	99.1	4.65	5.0	1500	47.2	34.6	0.73	2.07	54.3	22.8	2.8
	10.0	3.3	7.6	1250	47.9	2.94	37.8	105.5	4.77	5.6	1250	46.3	31.5	0.68	1.98	53.1	23.4	2.5
				1500	49.0	2.96	38.9	100.2	4.85	5.2	1500	47.6	34.8	0.73	2.02	54.5	23.6	2.7
	14.0	5.1	11.7	1250	49.5	3.01	39.3	106.7	4.82	5.8	1250	47.1	32.3	0.68	1.96	53.8	24.0	2.3
				1500	50.7	3.03	40.3	101.3	4.91	5.3	1500	48.4	35.7	0.74	2.00	55.2	24.2	2.5
70	6.0	1.6	3.7	1250	52.0	3.01	41.8	108.5	5.06	6.2	1250	44.0	30.8	0.70	2.31	51.9	19.1	3.7
				1500	53.5	3.07	43.0	103.0	5.11	5.7	1500	44.2	34.3	0.78	2.57	53.0	17.2	3.9
	10.0	3.2	7.4	1250	54.3	3.00	44.1	110.2	5.31	6.5	1250	44.4	31.0	0.70	2.25	52.1	19.8	3.4
				1500	55.3	3.00	45.1	104.2	5.41	5.9	1500	45.6	34.3	0.75	2.29	53.5	19.9	3.7
	14.0	4.9	11.3	1250	55.7	3.07	45.3	111.3	5.33	6.7	1250	45.1	31.8	0.70	2.23	52.7	20.3	3.2
				1500	56.7	3.06	46.3	105.0	5.43	6.1	1500	46.4	35.2	0.76	2.27	54.1	20.4	3.5
80	6.0	1.5	3.6	1250	58.5	3.07	48.0	113.3	5.58	6.9	1250	41.8	30.0	0.72	2.66	50.9	15.7	5.1
				1500	59.3	3.06	48.8	106.6	5.68	6.4	1500	42.9	33.3	0.77	2.71	52.2	15.8	5.4
	10.0	3.1	7.1	1250	61.3	3.05	50.9	115.4	5.88	7.2	1250	42.2	30.2	0.72	2.59	51.0	16.3	4.8
				1500	62.0	3.03	51.7	108.3	6.00	6.7	1500	43.3	33.4	0.77	2.64	52.4	16.4	5.2
	14.0	4.7	10.9	1250	62.2	3.12	51.5	116.0	5.84	7.4	1250	42.9	31.0	0.72	2.57	51.6	16.7	4.4
				1500	62.8	3.09	52.3	108.8	5.96	6.8	1500	44.1	34.3	0.78	2.62	53.0	16.8	4.9
90	6.0	1.5	3.4	1250	64.9	3.13	54.2	118.1	6.07	7.8	1250	39.6	29.3	0.74	3.02	49.9	13.1	6.8
				1500	65.5	3.10	54.9	110.4	6.19	7.2	1500	40.7	32.4	0.80	3.08	51.2	13.2	7.2
	10.0	3.0	6.9	1250	68.3	3.11	57.7	120.6	6.44	8.1	1250	39.9	29.4	0.74	2.94	49.9	13.6	6.4
				1500	68.7	3.06	57.8	112.4	6.57	7.4	1500	41.0	32.6	0.79	3.00	51.4	13.7	6.9
	14.0	4.6	10.5	1250	68.6	3.17	57.8	120.8	6.34	8.3	1250	40.6	30.6	0.75	2.88	50.4	14.1	5.9
				1500	68.9	3.12	58.3	112.5	6.47	7.8	1500	41.7	33.4	0.80	2.97	51.8	14.0	6.6
100	6.0	1.4	3.3	Operation not recommended							Operation not recommended							
	10.0	2.9	6.6								1250	36.9	28.6	0.77	3.36	48.4	11.0	8.3
											1500	38.0	31.6	0.83	3.43	49.7	11.1	8.9
	14.0	4.4	10.2								1250	37.6	29.3	0.78	3.33	48.9	11.3	7.7
											1500	38.6	32.5	0.84	3.40	50.2	11.4	8.5
110	6.0	1.4	3.2								Operation not recommended							
	10.0	2.8	6.4								1250	34.0	27.8	0.82	3.78	46.9	9.0	10.4
											1500	34.9	30.7	0.88	3.85	48.1	9.1	11.3
	14.0	4.2	9.8								1250	34.5	28.5	0.82	3.75	47.3	9.2	9.7
											1500	35.5	31.5	0.89	3.82	48.5	9.3	10.7
120	6.0	1.3	3.1								Operation not recommended							
	10.0	2.7	6.1								1250	28.0	25.9	0.92	4.25	42.5	6.6	12.6
											1500	28.6	28.1	0.98	4.36	43.4	6.6	13.6
	14.0	4.1	9.4								1250	28.3	25.9	0.91	4.11	42.3	6.9	11.7
											1500	28.9	28.1	0.97	4.24	43.4	6.8	12.9

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Performance Data cont.

072 - Dual Capacity with Variable Speed ECM High Speed (2200 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	12.0	3.3	7.6	Operation not recommended							Operation not recommended							
	15.0	4.7	10.8															
	18.0	6.2	14.3	1850	44.7	4.47	29.5	92.4	2.93	7.9								
				2200	45.6	4.42	30.5	89.2	3.02	7.1								
30	12.0	3.2	7.4	Operation not recommended							Operation not recommended							
	15.0	4.5	10.5	1850	54.0	4.53	38.6	97.0	3.49	8.3	1850	62.0	42.7	0.69	2.98	72.1	20.8	-
				2200	55.6	4.67	39.6	93.4	3.49	7.6	2200	63.0	46.7	0.74	3.13	73.7	20.1	-
	18.0	6.0	13.9	1850	55.6	4.77	39.3	97.8	3.42	8.5	1850	62.3	42.7	0.69	2.89	72.1	21.6	-
				2200	56.7	4.72	40.6	93.9	3.52	7.7	2200	63.8	46.7	0.73	3.03	74.1	21.1	-
40	12.0	3.1	7.1	Operation not recommended							Operation not recommended							
	15.0	4.4	10.2	1850	61.8	4.72	45.7	100.9	3.84	9.2	1850	68.4	46.7	0.68	3.31	79.7	20.7	-
				2200	63.7	4.82	47.3	96.8	3.87	8.4	2200	69.7	51.0	0.73	3.47	81.6	20.1	-
	18.0	5.8	13.5	1850	63.0	4.76	46.8	101.6	3.88	9.5	1850	69.0	46.7	0.68	3.21	79.9	21.5	-
				2200	65.1	4.87	48.5	97.4	3.92	8.6	2200	70.5	51.0	0.72	3.36	82.0	21.0	-
50	12.0	3.0	6.9	1850	67.2	4.79	50.8	103.6	4.11	9.9	1850	71.1	46.1	0.65	3.82	84.1	18.6	4.3
				2200	69.2	4.86	52.6	99.1	4.17	9.2	2200	74.8	51.2	0.68	4.02	88.5	18.6	4.5
	15.0	4.3	9.9	1850	69.6	4.90	52.9	104.8	4.16	10.2	1850	72.6	46.6	0.64	3.60	84.9	20.2	4.0
				2200	71.8	4.97	54.9	100.2	4.24	9.4	2200	76.4	51.8	0.68	3.78	89.2	20.2	4.3
	18.0	5.7	13.1	1850	71.2	4.94	54.3	105.6	4.22	10.5	1850	73.3	49.8	0.68	3.51	85.3	20.9	3.7
				2200	73.4	5.01	56.3	100.9	4.29	9.6	2200	77.2	55.3	0.72	3.69	89.8	20.9	4.1
60	12.0	2.9	6.7	1850	75.5	5.03	58.3	107.8	4.40	11.1	1850	70.2	46.3	0.66	4.18	84.5	16.8	5.5
				2200	78.0	5.06	60.7	102.8	4.51	10.3	2200	73.6	51.5	0.70	4.37	88.5	16.9	5.5
	15.0	4.1	9.6	1850	78.9	5.17	61.3	109.5	4.47	11.5	1850	71.9	46.8	0.65	3.97	85.4	18.1	4.9
				2200	81.5	5.21	63.7	104.3	4.59	10.6	2200	75.3	52.0	0.69	4.14	89.4	18.2	5.3
	18.0	5.5	12.7	1850	80.8	5.23	63.0	110.5	4.53	11.8	1850	72.6	49.3	0.68	3.88	85.8	18.7	4.5
				2200	83.5	5.25	65.6	105.1	4.66	10.9	2200	76.2	54.8	0.72	4.05	90.0	18.8	5.0
70	12.0	2.8	6.5	1850	35.4	5.27	17.4	87.7	1.97	12.5	1850	69.4	46.5	0.67	4.54	84.8	17.5	6.6
				2200	89.4	5.38	71.0	107.6	4.87	11.6	2200	74.5	54.4	0.73	4.50	89.5	16.6	6.9
	15.0	4.0	9.2	1850	88.3	5.45	69.7	114.2	4.75	12.9	1850	71.1	47.0	0.66	4.35	86.0	16.4	6.1
				2200	91.1	5.45	72.5	108.4	4.90	11.9	2200	74.2	52.1	0.70	4.50	89.9	16.5	6.6
	18.0	5.3	12.2	1850	90.5	5.51	71.7	115.3	4.81	13.3	1850	71.9	48.9	0.68	4.24	86.3	17.0	5.7
				2200	93.6	5.49	74.9	109.4	5.00	12.3	2200	75.1	54.2	0.72	4.41	90.1	17.0	6.3
80	12.0	2.7	6.3	1850	91.5	5.51	72.7	115.8	4.86	13.9	1850	67.0	46.1	0.69	4.97	83.9	13.5	8.4
				2200	94.7	5.47	76.1	109.9	5.08	12.8	2200	69.7	51.3	0.74	5.12	87.1	13.6	8.9
	15.0	3.9	8.9	1850	96.8	5.73	77.2	118.4	4.95	14.3	1850	68.8	46.7	0.68	4.79	85.2	14.4	7.8
				2200	100.1	5.68	80.7	112.1	5.17	13.2	2200	71.6	51.8	0.72	4.93	88.5	14.5	8.4
	18.0	5.1	11.8	1850	99.6	5.81	79.8	119.8	5.03	14.7	1850	69.6	47.8	0.69	4.69	85.6	14.8	7.2
				2200	103.0	5.72	83.5	113.4	5.28	13.6	2200	72.5	53.0	0.73	4.84	88.9	15.0	8.0
90	12.0	2.6	6.0	1850	99.1	5.76	79.5	119.6	5.05	15.4	1850	64.7	45.8	0.71	5.39	83.0	12.0	10.5
				2200	102.6	5.67	83.3	113.2	5.31	14.3	2200	66.9	50.8	0.76	5.52	85.8	12.1	11.1
	15.0	3.7	8.6	1850	105.3	6.01	84.8	122.7	5.13	15.9	1850	66.6	46.3	0.70	5.24	84.4	12.7	9.8
				2200	109.1	5.91	88.9	115.9	5.41	14.7	2200	69.0	51.4	0.74	5.37	87.4	12.9	10.6
	18.0	4.9	11.4	1850	108.7	6.10	87.8	124.4	5.22	16.4	1850	68.5	47.7	0.70	4.96	85.4	13.8	9.1
				2200	112.4	5.95	92.1	117.3	5.54	15.2	2200	69.8	51.8	0.74	5.26	87.7	13.3	10.1
100	12.0	2.5	5.8	Operation not recommended							Operation not recommended							
	15.0	3.6	8.3								1850	63.1	45.7	0.72	5.85	83.1	10.8	12.2
											2200	65.2	50.7	0.78	5.94	85.5	11.0	13.2
	18.0	4.8	11.0								1850	63.8	45.6	0.71	5.75	83.4	11.1	11.3
											2200	65.9	50.5	0.77	5.84	85.8	11.3	12.5
110	12.0	2.4	5.6								Operation not recommended							
	15.0	3.5	8.0								1850	59.7	45.1	0.75	6.47	81.8	9.2	14.9
											2200	61.4	50.1	0.82	6.51	83.6	9.4	16.1
	18.0	4.6	10.6								1850	60.4	44.5	0.74	6.35	82.0	9.5	13.8
											2200	62.0	49.1	0.79	6.42	83.9	9.7	15.3
120	12.0	2.3	5.4								Operation not recommended							
	15.0	3.3	7.7								1850	55.7	43.7	0.78	7.17	80.2	7.8	18.0
											2200	56.7	47.4	0.84	7.36	81.8	7.7	19.5
	18.0	4.4	10.2								1850	56.2	43.7	0.78	6.94	79.9	8.1	16.7
											2200	57.4	47.4	0.83	7.16	81.8	8.0	18.5

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Performance Data cont.

072 - Dual Capacity with Variable Speed ECM Low Speed (1700 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	10.0	2.3	5.4	Operation not recommended							Operation not recommended							
	13.0	3.5	8.1															
	16.0	5.0	11.6	1400	34.5	3.52	22.5	92.8	2.87	5.9								
				1700	34.8	3.48	22.9	89.0	2.93	5.3								
30	10.0	2.3	5.3	Operation not recommended							Operation not recommended							
	13.0	3.4	7.9	1400	36.8	3.40	25.2	94.3	3.17	5.5	1400	49.8	34.1	0.69	1.73	55.7	28.8	-
				1700	38.3	3.49	26.4	90.9	3.22	4.7	1700	50.6	37.3	0.74	1.82	56.8	27.8	-
	16.0	4.9	11.3	1400	40.4	3.62	28.0	96.7	3.27	5.0	1400	50.1	34.1	0.68	1.68	55.8	29.9	-
				1700	40.8	3.58	28.6	92.2	3.34	5.7	1700	51.3	37.3	0.73	1.76	57.3	29.1	-
40	10.0	2.2	5.1	Operation not recommended							Operation not recommended							
	13.0	3.3	7.6	1400	43.7	3.51	31.7	98.9	3.65	6.5	1400	55.3	37.3	0.67	1.94	61.9	28.6	-
				1700	45.2	3.57	33.0	94.6	3.71	5.9	1700	56.4	40.7	0.72	2.03	63.3	27.8	-
	16.0	4.7	11.0	1400	46.1	3.59	33.8	100.5	3.76	6.7	1400	55.8	37.3	0.67	1.88	62.2	29.7	-
				1700	47.7	3.66	35.2	96.0	3.82	6.1	1700	57.0	40.7	0.71	1.97	63.7	29.0	-
50	10.0	2.1	4.9	1400	48.8	3.61	36.5	102.3	3.97	6.8	1400	59.5	38.6	0.65	2.20	67.0	27.0	2.3
				1700	50.4	3.66	37.9	97.4	4.03	6.3	1700	61.1	42.8	0.70	1.00	64.5	28.1	2.4
	13.0	3.2	7.4	1400	50.6	3.61	38.2	103.4	4.10	7.0	1400	60.0	38.9	0.65	2.15	67.3	27.9	2.1
				1700	52.1	3.66	39.6	98.4	4.17	6.4	1700	61.7	43.0	0.70	2.19	69.2	28.2	2.3
	16.0	4.6	10.6	1400	52.9	3.70	40.3	105.0	4.20	7.2	1400	61.0	39.8	0.65	2.13	68.3	28.7	2.0
				1700	54.5	3.74	41.7	99.7	4.27	6.6	1700	62.7	44.1	0.70	2.17	70.1	28.9	2.2
60	10.0	2.1	4.8	1400	56.1	3.73	43.3	107.1	4.40	7.5	1400	56.7	37.7	0.66	2.54	65.4	22.3	3.2
				1700	57.5	3.76	44.6	101.3	4.48	6.9	1700	58.3	41.7	0.71	2.59	67.2	22.5	3.4
	13.0	3.1	7.2	1400	58.3	3.73	45.6	108.6	4.58	7.7	1400	57.2	37.9	0.66	2.48	65.7	23.1	3.0
				1700	59.7	3.75	46.9	102.5	4.67	7.1	1700	58.8	41.9	0.71	2.53	67.5	23.3	3.2
	16.0	4.4	10.3	1400	60.3	3.81	47.3	109.9	4.64	7.9	1400	58.2	38.8	0.67	2.46	66.6	23.7	2.8
				1700	61.7	3.83	48.6	103.6	4.72	7.3	1700	59.8	43.0	0.72	2.51	68.3	23.9	3.1
70	10.0	2.0	4.6	1400	63.2	3.86	50.1	111.8	4.80	8.3	1400	54.0	36.7	0.68	2.89	63.8	18.7	4.4
				1700	65.6	3.85	52.5	105.7	4.99	7.7	1700	56.0	41.8	0.75	3.00	65.8	18.7	4.6
	13.0	3.0	6.9	1400	66.0	3.84	52.9	113.7	5.03	8.5	1400	54.5	36.9	0.68	2.81	64.1	19.4	4.1
				1700	67.2	3.84	54.1	106.6	5.13	7.9	1700	56.0	40.9	0.73	2.87	66.2	19.5	4.4
	16.0	4.3	9.9	1400	67.7	3.93	54.3	114.8	5.05	8.8	1400	55.4	37.9	0.68	2.79	64.9	19.9	3.8
				1700	68.9	3.92	55.5	107.5	5.15	8.1	1700	56.9	41.9	0.74	2.84	66.6	20.0	4.2
80	10.0	1.9	4.5	1400	70.9	3.98	57.3	116.9	5.22	9.2	1400	51.6	35.9	0.69	3.29	62.8	15.7	6.2
				1700	71.9	3.96	58.4	109.2	5.32	8.5	1700	53.0	39.7	0.75	3.35	64.5	15.8	6.6
	13.0	2.9	6.7	1400	74.3	3.95	60.8	119.2	5.51	9.5	1400	52.1	36.1	0.69	3.20	63.0	16.3	5.8
				1700	75.2	3.92	61.8	111.0	5.62	8.8	1700	53.5	39.9	0.75	3.26	64.7	16.4	6.3
	16.0	4.2	9.6	1400	75.4	4.04	61.6	119.8	5.47	9.8	1400	52.9	37.0	0.70	3.17	63.8	16.7	5.4
				1700	76.2	4.00	62.5	111.5	5.58	9.1	1700	54.4	41.0	0.75	3.24	65.4	16.8	6.0
90	10.0	1.9	4.3	1400	78.6	4.10	64.6	122.0	5.62	10.3	1400	49.2	35.0	0.71	3.69	61.8	13.4	8.0
				1700	79.3	4.05	65.4	113.2	5.73	9.5	1700	50.6	38.8	0.77	3.76	63.4	13.5	8.5
	13.0	2.8	6.5	1400	82.7	4.06	68.8	124.7	5.96	10.6	1400	49.7	35.2	0.71	3.59	61.9	13.8	7.5
				1700	83.2	4.01	69.5	115.3	6.08	9.8	1700	51.1	39.0	0.76	3.66	63.6	13.9	8.1
	16.0	4.0	9.3	1400	83.0	4.15	68.9	124.9	5.87	11.0	1400	50.2	35.9	0.72	3.55	62.3	14.1	6.9
				1700	83.4	4.08	70.1	115.4	5.99	10.2	1700	51.9	40.0	0.77	3.63	64.3	14.3	7.7
100	10.0	1.8	4.2	Operation not recommended							Operation not recommended							
	13.0	2.7	6.2								1400	46.7	34.4	0.74	4.11	60.7	11.4	10.0
											1700	48.0	38.1	0.79	4.19	62.3	11.5	10.9
	16.0	3.9	8.9								1400	47.5	35.3	0.74	4.07	61.4	11.7	9.3
											1700	48.8	39.1	0.80	4.15	63.0	11.8	10.4
110	10.0	1.7	4.0	Operation not recommended							Operation not recommended							
	13.0	2.6	6.0								1400	43.7	33.6	0.77	4.62	59.5	9.5	12.7
											1700	45.0	37.2	0.83	4.71	61.0	9.5	13.8
	16.0	3.7	8.6								1400	44.5	34.4	0.77	4.58	60.1	9.7	11.8
											1700	45.7	38.1	0.83	4.67	61.6	9.8	13.1
120	10.0	1.7	3.8								Operation not recommended							
	13.0	2.5	5.8								1400	41.6	34.2	0.82	5.29	59.7	7.9	15.8
											1700	42.4	37.1	0.88	5.43	60.9	7.8	17.1
	16.0	3.6	8.2								1400	42.0	34.2	0.81	5.12	59.5	8.2	14.6
											1700	42.9	37.1	0.86	5.28	60.9	8.1	16.3

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Service Parts List

	Parts List	018	024	030	036	042	048	060	072
Compressor	Compressor 208-230/60/1	34P748-01	34P749-01	34P750-01	34P751-01	34P752-01	34P753-01	34P755-01	34P756-01
	Run Capacitor 208-230/60/1	16P008D18K	16P008D18K	16P008D19K	16P008D21K	16P008D20K	16P008D31K	16P008D32K	16P008D34K
	Sound Jacket	92P504A05	92P504A05	92P504A05	92P504A05	92P504A16	92P504A16	92P504A16	92P504A16
	Power Harness	11P781-01	11P781-01	11P781-01	11P781-01	11P781-01	11P781-01	11P781-01	11P781-01
	Solenoid Harness	11P782-02	11P782-02	11P782-02	11P782-02	11P782-02	11P782-02	11P782-02	11P782-02
ECM Motor & Blower	ECM Motor 208-230/60/1	14S574-01	14S574-01	14S574-01	14S573-01	14S573-01	14S573-01	14S572-01	14S572-01
	ECM Blower Housing	53P500B01	53P500B01	53P500B01	53P501B01	53P501B01	53P501B01	53P501B01	53P501B01
	ECM Harness - horizontal	11P827-02	11P827-02	11P827-02	11P827-02	11P827-02	11P827-02	11P827-02	11P827-02
	ECM Harness - vertical	11P827-01	11P827-01	11P827-01	11P827-01	11P827-01	11P827-01	11P827-01	11P827-01
	ECM Power Harness - vertical	11P585B01	11P585B03	11P585B03	11P585B03	11P585B03	11P585B03	11P585B03	11P585B03
	ECM Power Harness - horizontal	11P585B04	11P585B04	11P585B04	11P585B04	11P585B04	11P585B04	11P585B04	11P585B04
Air Filters	2" Air Filters (Horizontal Model) and Second Filter If Needed	59P509-13	59P509-09	59P509-09	59P509-10	59P509-02	59P509-02	59P509-03	59P509-03
		n/a	n/a	n/a	n/a	59P509-11	59P509-11	59P509-11	59P509-11
	2" Air Filters (Vertical Model)	59P509-12	59P509-04	59P509-04	59P509-08	59P509-07	59P509-07	59P509-06	59P509-06
	2" Air Filters (Bottom Flow Model)	n/a	59P509-04	59P509-04	59P509-06	59P509-06	59P509-06	59P509-06	59P509-06
Refrigeration Components	Air Coil (Vertical Model)	61P721-41	61P705-41	61P711-41	61P706-41	61P780-41	61P780-41	61P725-41	61P725-41
	Air Coil (Horizontal Model)	61P720-41	61P707-41	61P708-41	61P709-41	61P710-41	61P710-41	61P717-41	61P717-41
	Coax	62I503A01	62I504-01	62I588-01	62I583-01	62I583-01	62I628-01	62I628-01	62I555-01
	EEV	33P617-01	33P617-01	33P617-01	33P617-01	33P617-01	33P617-01	33P617-01	33P617-01
	Reversing Valve	33P502-05	33P506-04	33P506-04	33P503-05	33P503-05	33P526-05	33P526-05	33P526-05
	Discharge Muffler	36P503B02	36P503B02	36P503B02	36P503B02	36P503B02	36P503B02	36P503B02	36P503B02
	Filter Dryer	36P500B01	36P500B01	36P500B01	36P500B01	36P500B01	36P500B01	36P500B02	36P500B02
Desuperheater	Hot Water Generator	62P516-05	62P516-05	62P516-05	62P516-05	62P516-03	62P516-03	62P516-03	62P516-03
	Hot Water Generator Pump	24P501A01	24P501A01	24P501A01	24P501A01	24P501A01	24P501A01	24P501A01	24P501A01
Electrical	Contactor	13P521-01	13P521-01	13P521-01	13P521-01	13P521-01	13P521-01	13P521-01	13P521-01
	Transformer 208-230/60/1	15P501B01	15P501B01	15P501B01	15P501B01	15P501B01	15P501B01	15P501B01	15P501B01
	3 Pole Power Block	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06
	2 Pole Screw Term. Block	12P500A01	12P500A01	12P500A01	12P500A01	12P500A01	12P500A01	12P500A01	12P500A01
	ABC Board	17X553-48	17X553-48	17X553-48	17X553-48	17X553-48	17X553-48	17X553-48	17X553-48
	AXB Board	17X597-34	17X597-34	17X597-34	17X597-34	17X597-34	17X597-34	17X597-34	17X597-34
	ASB Board	17P599-01	17P599-01	17P599-01	17P599-01	17P599-01	17P599-01	17P599-01	17P599-01
	ASB Sensor	19P688-01	19P688-01	19P688-01	19P688-01	19P688-01	19P688-01	19P688-01	19P688-01
	ABC/AXB Communication Cable	11P837-01	11P837-01	11P837-01	11P837-01	11P837-01	11P837-01	11P837-01	11P837-01
	ABC/AXB/ASB Communication Cable	11P837-05	11P837-05	11P837-05	11P837-05	11P837-05	11P837-05	11P837-05	11P837-05
	Keystone Category 5 Coupler (AID Port)	12P553-01	12P553-01	12P553-01	12P553-01	12P553-01	12P553-01	12P553-01	12P553-01
	Category 5 cable (AID Port to ABC)	11P846-01	11P846-01	11P846-01	11P846-01	11P846-01	11P846-01	11P846-01	11P846-01
	Rocker Switch - HWG ON/OFF	13P607A01	13P607A01	13P607A01	13P607A01	13P607A01	13P607A01	13P607A01	13P607A01
	Pump Circuit Breaker - 5 amp, 250v	19P583-01	19P583-01	19P583-01	19P583-01	19P583-01	19P583-01	19P583-01	19P583-01
Sensors & Safeties	Thermistor, Low Water Coil Limit (FP1)	FP1RK01	FP1RK01	FP1RK01	FP1RK01	FP1RK01	FP1RK01	FP1RK01	FP1RK01
	Thermistor, Hot Water Limit (HWG)	12P505-10	12P505-10	12P505-10	12P505-10	12P505-10	12P505-10	12P505-10	12P505-10
	Current Sensors	12P557-01	12P557-01	12P557-01	12P557-01	12P557-01	12P557-01	12P557-01	12P557-01
	Flow Meter Sensor Kit (clip, sensor, harness)	29P536-01	29P536-01	29P536-01	29P535-01	29P535-01	29P535-01	29P535-01	29P535-01
	Flow Meter O-rings	29P560-01	29P560-01	29P560-01	29P559-01	29P559-01	29P559-01	29P559-01	29P559-01
	Thermistor Vertical, Air Coil Freeze Detection (FP2)	12P550-01	12P550-01	12P550-01	12P550-01	12P550-01	12P550-01	12P550-01	12P550-01
	Thermistor, Suction Line	12P555-09	12P555-05	12P555-10	12P555-05	12P555-10	12P555-05	12P555-05	12P555-05
	Thermistor, Liquid Line Heating	12P555-03	12P555-03	12P555-03	12P555-03	12P555-03	12P555-03	12P555-03	12P555-03
	Thermistor, Entering Water	12P560-01	12P560-01	12P560-01	12P560-01	12P560-01	12P560-01	12P560-01	12P560-01
	Thermistor, Leaving Water	12P560-02	12P560-02	12P560-02	12P560-02	12P560-02	12P560-02	12P560-02	12P560-02
	Thermistor, Leaving Air	12P555-06	12P555-06	12P555-06	12P555-06	12P555-06	12P555-06	12P555-06	12P555-06
	High Pressure Switch	SKHPE600	SKHPE600	SKHPE600	SKHPE600	SKHPE600	SKHPE600	SKHPE600	SKHPE600
	Low Pressure Switch	SKLPE40	SKLPE40	SKLPE40	SKLPE40	SKLPE40	SKLPE40	SKLPE40	SKLPE40

Part numbers subject to change

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Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate system electrically.
3. Before attempting the procedure, ensure that:
   - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
   - all personal protective equipment is available and being used correctly;
   - the recovery process is supervised at all times by a competent person;
   - recovery equipment and cylinders conform to the appropriate standards.
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80 % volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
11. Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked

Decommissioning - Unit Labeling Requirements

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

Refrigerant Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Refrigerant Removal and Evacuation

When breaking into the refrigerant circuit to make repairs – or for any other purpose conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- safely remove refrigerant following local and national regulations;
- evacuate;
- purge the circuit with inert gas (optional for A2L);
- evacuate (optional for A2L);
- continuously flush or purge with inert gas when using flame to open circuit; and
- open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants.

This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Charging Procedures

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Revision Guide

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8, 95	physical data table (remove high static), updated contactor part number	26 June 2024	MA
96-98	Added A2L Decommissioning and Refrigerant Recovery/Removal	27 June 2024	SW

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